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STRUCTURAL TIMBER HAND BOOK

ON

PACIFIC COAST WOODS

PUBLISHED BY

THE WEST COAST LUMBERMEN'S ASSOCIATION
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INTRODUCTION

The purpose of this book is to present information relative to structural timber which will be useful to engineers, architects, and contractors. Particular attention has been given to Pacific Coast species.

There have been published from time to time by the U. S. Forest Service and other organizations data showing the strength and durability of Pacific Coast timber. In writing this book an effort has been made to collect such of these data as are up to date and to present them in a concise form for general use.

A brief description is given of the four principal species of wood found in Washington and Oregon, viz., Douglas Fir, Western Red Cedar, Western Hemlock and Sitka Spruce. This information may be of interest to those not entirely familiar with Pacific Coast conditions.

Many thousands of computations have been made in preparing the tables in this book. All computations have been crosschecked to eliminate possible errors. Tables show the safe total loads and corresponding deflections for rectangular beams of various sizes. The number of pounds per board foot of lumber, supported by beams, is also shown, which will assist in effecting economical designs. Tables have been computed which show the safe loads on beams limited by the horizontal shearing stress. Other tables show safe total loads on columns of various sizes and still other tables give the maximum spans for mill and laminated floors, board measure for various dimensions and lengths, and board measure and weight for unit lengths of Douglas fir dimension timber.

Data and figures are given on timber frame-brick mill buildings, showing costs, insurance rates, and details of construction. Standard formulas for computing stresses covering the usual practical conditions are given. A grading rule for securing structural timbers of high strength is also included.

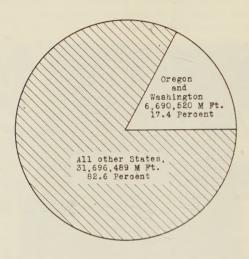
A considerable amount of data is presented on the creosoting of Douglas fir lumber in various forms, such as bridge stringers, mine timbers, piling, ties, bridge caps, paving blocks, silo staves, and other forms. Space is devoted to wooden silos and red cedar shingles. Kiln drying lumber is briefly discussed as well as other subjects of interest to the consumer of wood.

Acknowledgment is herewith made of the able review of the manuscript of this book by Paul P. Whitham, Assoc. Mem. Am. Soc. C. E., Consulting Civil Engineer and former Chief Engineer, Port of Seattle, and Charles C. More, Assoc. Mem. Am. Soc. C. E., Professor of Civil Engineering, University of Washington, both of whom are men of wide experience in the use of structural timber.



A Giant Douglas Fir 17 Feet in Diameter.

LUMBER CUT OF UNITED STATES - 1913



TIMBER SUPPLY OF UNITED STATES

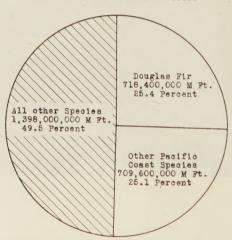


Fig. 1. Lumber cut of United States in 1913 and distribution of the standing timber supply.

PACIFIC COAST TIMBER

The largest and finest growth of timber in the world is found on the Pacific Coast. Figure 1 shows that Douglas fir, a single species, composes more than 25 per cent of the entire standing timber supply of the United States, including both softwoods and hardwoods.

The timber stand of Washington and Oregon is such as to insure a permanent source of supply of the highest class of lumber. The winter climate in this vast timber belt is very mild, enabling the lumber camps and mills to operate continuously, thereby producing a steady supply of manufactured products. Practically all log transportation is by water and many of the mills are located on tidewater. These conditions make possible the production of lumber at a minimum operating cost.

One of the most striking features of the timber supply of Washington and Oregon is the particularly large sizes of timbers which are available. Structural timbers of Douglas fir 18"x18"x120' to 140' in length may be had at any time and timbers 36"x36"x50' to 80' in length are as readily available. This gives some idea as to the possibilities in manufacturing structural forms from the huge logs available in these timber states.

Lumbering has for many years been the largest industry in the states of Washington and Oregon, and will continue to hold first place for many years to come. Statistics from the U.S. Department of Agriculture Bulletin No. 232 show the lumber cut of these states to have been 6,690,520,000 feet board measure in 1913. This cut amounted to 17.4 per cent of the total lumber cut in the United States in the same year. The lumber products of Washington and Oregon for 1913 were distributed to almost every part of the United States. Approximately 9 per cent were exported to foreign countries. The accompanying map (Fig. 2) was prepared by the U.S. Forest Service, Portland, Oregon, and shows the percentage of the lumber cut in Washington and Oregon in 1913 which was shipped to the various states. This wide distribution is accounted for by the fact that with Douglas Fir, Western Red Cedar, Western Hemlock and Sitka Spruce from which to select, it is possible to secure a material which will serve any use for which wood is adapted.



Fig. 2. Distribution of cut of Douglas Fir and associated species from the States of Washington and Oregon. Figures given in percentage of total cut, and in board feet per capita.

In order to give some idea of the uses to which these four species may best be placed, the following description may be of interest:

DOUGLAS FIR

(Pseudotsuga taxifolia)

Common names in use: Red fir, yellow fir, Oregon pine, Puget Sound pine and Douglas spruce.

The name Douglas fir has, however, recently been adopted by the U.S. Forest Service and is rapidly replacing other names previously used for this species.

Douglas fir is by far the most important of these species. It would be difficult to give a better general description of this wood than is found in the following quotations taken from U. S. Forest Service Bulletin No. 88.

"Douglas fir may, perhaps, be considered as the most important of American woods. Though in point of production it ranks second to southern yellow pine, its rapid growth in the Pacific Coast forests, its comparatively wide distribution and the great variety of uses to which its wood can be put, place it first. It is very extensively used in the building trades; by the railroads in the form of ties, piling, car and bridge material and by many of the manufacturing industries of the country. As a structural

timber it is not surpassed and probably it is most widely used and known in this capacity."

"Douglas fir is manufactured into almost every form known to the sawmill operator. A list of such forms and uses would represent many industries and would include piling and poles, mine timbers, railway ties, bridge and trestle timbers, timbers for car construction; practically all kinds of lumber for houses, material for the furniture maker and boat builder; special products for cooperage, tanks, paving blocks, boxes, and pulpwood; fuel; and a long line of miscellaneous commodities."

"Piling is extensively employed in harbor-improvement work and in preparing foundations in soft ground for bridges, trestles and other heavy structures. The long, straight, slightly tapering trunk of Douglas fir fits it for this use, and it is strong, resilient, and fairly durable. It has no important competitor as a pile timber in the western part of the United States, and is used almost exclusively for marine and railroad work on the Pacific Coast. The wood is sufficiently hard to penetrate readily most soils, and it acts well under the hammer. It is occasionally necessary to band the tops of piles to prevent brooming and splitting, but bands are used only where hard subsoils must be penetrated."

"Ties of Douglas fir are both sawed and hewed, though three-fourths are sawed. Those which are sawed are made both from second growth and from mature trees. About two-thirds of the ties supplied by the forests of the western part of the United States are of Douglas fir, the remaining one-third consisting chiefly of western yellow pine, lodgepole pine, redwood and western hemlock. Practically all the large sawmills in Washington and Oregon cut fir ties to order, and some small mills cut little or nothing else. It is customary to saw ties from a large portion of low-grade material obtained in the usual milling operations. Douglas fir generally yields about 25 per cent of high-grade lumber and the remaining 75 per cent must be worked into lower grade lumber, dimension products, timbers, and ties."

"BRIDGE AND TRESTLE TIMBERS. Probably the Pacific Coast railroads use more Douglas fir than is consumed by any other single industry. Bridge and trestle timbers of the wood compare favorably in their structural merits with those from any other American species. They are light and strong, fairly resilient and durable, and can be had in any desired size or specification. In

trestles, fir is used in the round form for piling, and in dimension sizes for posts, caps, sills, ties, girts, and braces."

"CAR MATERIAL. Douglas fir car sills are used in the construction and repair of freight and passenger cars throughout the United States. Their strength, elasticity, durability, and the ease with which the wood may be worked make them preferable to all others. The wood is much employed in car building for purposes other than sills. In fact, it is used for nearly all purposes, except for draft-rigging supports, which are made of oak or maple. It is employed for siding, framing, flooring, roofing, and many other parts of passenger cars. Though the interior finish of cars is generally of hardwood, Douglas fir has been given place in some dining and private cars, because of the beauty of its grain."

"House Construction Material. For house construction Douglas fir is manufactured into all forms of dimension stock, and is used particularly for general building and construction purposes. Its strength and comparative lightness fit it for joists, floor beams, rafters, and other timbers which must carry loads. Occasionally entire buildings are constructed of it, and in some parts of the Pacific States it is practically the only common lumber used. The largest consumption is in Washington, California, Oregon, Utah, Idaho, and Colorado."

"FLOORING. The comparative hardness of the wood fits it for flooring, and it meets a large demand. Douglas fir edge-grain flooring is often considered superior to that made from any other American softwood, and it is used on the Pacific Coast to the exclusion of nearly all others."

"Finish. Clear lumber, sawed flat grain, shows pleasing figures, and the contrast between the spring and summer wood has been considered as attractive as the grain of quarter-sawed oak. It takes stain well, and by staining, the beauty of the grain may be more strongly brought out, and a number of costly woods can be successfully imitated. Fir finish has been widely advertised, and the demand for it in the Eastern States, the Middle Western States, and in the Upper Mississippi Valley is rapidly increasing. Its chief use is for door and window casing, baseboards, and all kinds of panelwork. Practically all of the finish is used by the building trades, and the largest use naturally is near the points of production, though it is in great demand in Southern California and in Hawaii."

"PAVING BLOCKS. Paving blocks of Douglas fir, when given preservative treatment, are rapidly coming into use in municipal improvements. The wood's hardness and the comparative ease with which the blocks may be treated with creosote make it compare favorably with other paving woods. The blocks wear slowly under heavy traffic, are nearly noiseless, furnish fair toe hold to horses, are resilient, and are practically impervious to water. It is important, however, that they be thoroughly impregnated with preservative."

WESTERN RED CEDAR (Thuja plicata)

Common names in use: Red cedar, Arborvitae, Western cedar, canoe cedar, and gigantic red cedar.

Western red cedar has certain individual qualifications which particularly fit it for certain purposes. The wood is soft and straight grained. It is especially suited for siding or any outside forms exposed to the weather since it has remarkable durability and holds paint and stains well. Red cedar is used for the construction of rowboats, canoes, motorboats, and similar small vessels. Having a low shrinkage factor, it readily resists alternate changes from wet to dry. Red cedar is cut extensively into shingles and for this use it has no equal. The life of the red cedar shingle is measured by its mechanical wear since it does not decay. Red cedar is a particularly favored wood for use in lining closets and making clothes chests. The odor of the wood is very pleasant, but it is objectionable to moths and similar insects.

Western red cedar is a beautiful wood to work since its grain is so uniform. It may be very smoothly finished and is beautiful for ceiling, paneling, or finishing in places where the wood is not subjected to hard wear.

Western red cedar is extensively used as a pole and post timber. It has the required strength for this use and its natural resistance to decay is responsible for its wide application in this field.

WESTERN HEMLOCK (Tsuga heterophylla)

Common names in use: Hemlock, Western hemlock, Western hemlock fir, and Alaska pine.

As western hemlock is becoming better known it is gradually gaining a reputation as a distinctive wood, not to be confused in

its properties with other species of the same family. It is used extensively in building operations on the Pacific Coast and locally commands the same price as Douglas fir for this purpose. The following quotations are taken from U. S. Forest Service Bulletin 115 and give a fair idea of the merits and adaptability of this wood.

"STRUCTURAL USES. The demand for western hemlock both in the form of ordinary lumber and for special uses will no doubt increase when its properties are better known. At present it has a very poor market standing because of the prejudice against the name "hemlock." The lumber is practically free from pitch, has a handsome grain, takes paints and stains well, and works smoothly, both spring and summer wood standing up well to the cutting edge. It is at present manufactured into the common forms of lumber, and is also used for pulp, boxes, barrels, sash and door stock, fixtures, furniture and other special uses."

"Bridge and Trestle Timbers. Western hemlock is well suited for use in all but the heaviest construction work, as shown by results of the tests discussed in this bulletin; but up to the present it has had a limited use in bridges and trestles. It has been used in some instances for caisson construction."

"Crossties. A considerable amount of western hemlock is cut into crossties. Many of the western railroads use Douglas fir, western larch, redwood, and western hemlock almost exclusively for tie material."

"Poles and Piling. Occasionally western hemlock is cut into telephone or telegraph poles, but its use in this form has been very limited. It has the requisite strength for pole use and grows in such dimensions as to make it very suitable for this class of work. With a good butt treatment with some efficient preserving fluid it should give good service as a pole material."

"Though practically all piling in the Pacific Northwest is of Douglas fir, western hemlock is used to a limited extent, however, for this class of work and has apparently given satisfaction."

"FLOORING. Western hemlock, when cut edge grain, makes an excellent flooring material. It finishes smoothly on account of the uniform texture of the wood and it also wears evenly. It is not suitable for use in damp places, on account of its tendency to warp under such conditions."

"Inside Finishing. As a finish lumber western hemlock has the advantage of containing practically no pitch; it has a beautiful grain, works smoothly, takes stain readily, and, when properly dried, will not shrink or swell materially under normal conditions. It presents a comparatively hard surface and consequently does not mar easily."

"Barrels and Boxes. Western hemlock is used to a large extent for barrels and boxes for shipping foodstuffs. For this purpose it serves admirably, since the wood is odorless and tasteless. Its strength and lightness also add to its value for these uses. It has some tendency to split when nails are driven into it, but this fault may be largely overcome by the use of fine nails."

SITKA SPRUCE (Picea sitchensis)

Common names in use: Tideland spruce, Great tideland spruce, and Western spruce.

The peculiar characteristics of spruce have obtained for it a wide variety of applications.

It is a very white, straight-grained wood of tough fiber, is entirely without taste or odor, and is of exceptionally light weight and extremely stiff. It is probably the stiffest softwood in the United States, in proportion to its weight.

It cuts to particular advantage for doors, window and door frames, mouldings, stepping, cornices, and is extensively used for bevel siding for house construction.

It is very desirable and economical for large doors, such as are used for garages, freight houses and similar structures.

Because of its entire lack of taste or odor it is unsurpassed for the manufacture of containers for shipping butter, meats and other food products, and it is given special preference for making refrigerators.

It is highly valued, and has a wide demand in the construction of pianos, organs, violins, guitars and mandolins.

Because of its stiffness, tough fiber, straight grain, and light weight, it has been given a prominent place in the building of aeroplanes.

Spruce has been used quite extensively in pontoon bridge construction. It is found to combine strength and lightness to the highest degree, and is easily transported from place to place, and is tough enough to stand rough usage.

MECHANICAL AND PHYSICAL PROPERTIES OF TIMBER

It is difficult to obtain a correct comparison of the strength properties of structural timbers, yet, from a practical point of view, structural sizes furnish the data sought by engineers and others to guide them in their designs.

In preparation of the following tables showing the various properties of structural timbers, every effort has been made to obtain the most up to date figures available. In all comparisons made consideration has been given to the size of the timbers, general quality, moisture condition and to other factors which affect the strength. Many publications have been issued from time to time containing values for structural timbers. In many cases the timbers have been unlike in grades and have varied materially in moisture content. Due to variations in such factors as mentioned, comparisons have been in many cases very misleading. This point has been recognized in preparing the following data and every effort has been made to eliminate comparisons which are not on the same basis.

VARIABILITY OF TIMBER

All species of timber show variations in weight and strength. These variations are considerable in some cases depending upon the quality of the clear wood as well as the grade and condition of seasoning of the timber. It is essential that the quality of the timbers of any species be determined by due consideration of these factors rather than locality of growth, etc. The density classification for Douglas fir timbers proposed on pages 31 to 33 is expected to eliminate to a large extent these variables and insure a product of uniform strength qualities.

BENDING STRENGTH OF LARGE STRINGERS

Tables 1 and 2 show results obtained from U. S. Forest Service Bulletin No. 108, pages 74 to 123. In order to make the comparison fair to all species approximately 30 per cent of the lowest tests were discarded, thus eliminating timbers with serious defects. This elimination is particularly necessary because of the fact that certain species were tested in many cases with large knots purposely placed on the tension face of the beam in order to determine the influence of such defects upon the strength. Douglas fir was the principal species used in studying the effect

TIMBERS	
AVERAGE STRENGTH VALUES FOR STRUCTURAL TIMBERS	1
FOR	-
VALUES	The state of the s
STRENGTH	7
AVERAGE	

Heat	Rings Moisture per Content	Meight Stress Stress of Piber Stress of Stress	ure	× 50	Fiber Stress at Elastic Limit	Modulus of Rupture per		Relative Strength based on Modulus of Rupture.	Relative Stiffness based on Modulus of Elasticity.	Vol. I	Knots	Knots in Stringers Tested Vol. II Vol. II	ngers 7	ested Vol. III	III
Lbs. Lbs. 1000 lbs. Por Cent Po				dry	per Sq. In.	Sq. In.	per Sq. In.	Douglas Fir=100 per cent	Douglas Fir—100 per cent	Less than 11% In	and	Less than 11% In	and	Less than	and over
(132) (4282) 6605 1611 100.0 100.0 1.2 35.4 3855 6437 1466 97.4 91.0 0.4 31.4 3376 5948 1546 90.0 96.0 0.4 28.1 3761 5821 1489 88.1 92.4 0.7 31.2 3266 5568 1467 84.4 91.1 0.2 28.7 3677 5562 1364 84.2 84.6 0.9 29.3 4323 5327 1202 80.6 74.6 0.9 29.3 3231 4984 1268 75.5 78.7 0.9 25.2 2397 3767 1042 57.0 64.7 2.5			er Cent	Lbs.	Lbs.	1	1000 lbs.	Per Cent	Per Cent	1/2 -11	5	7.7		.7274	7
2 35.4 3855 6437 1466 97.4 91.0 0.4	10	6.01	31.8	28.9 (132)	4282 (133)	6605	1611	100.0	100.0	1.2	0.5	1.7	0.7	10.0	0.0 0.0
4 31.4 3376 5948 1546 90.0 96.0 0.4 0 9 28.1 315 5821 1489 88.1 92.4 0.7 0 0 31.2 3266 5568 1467 84.4 91.1 0.2 0 5 28.7 3677 5562 1364 84.2 84.6 0.9 0 2 23.3 4323 5327 1202 80.6 74.6 0.9 0 9 29.3 3231 4884 1268 75.5 78.7 0.9 0 1 25.2 2397 3767 1042 57.0 64.7 2.5 1	14.6	96	29.3	35.4	3855	6437	1466		91.0	0.4		0.5	0.2	4.0	1.1
9 28.1 3761 5521 1489 88.1 92.4 0.7 0 0 31.2 3266 5568 1467 84.4 91.1 0.2 0 5 28.7 3677 5562 1364 84.2 84.6 0.9 0 2 23.3 4323 5327 1202 80.6 74.6 0.9 0 9 29.3 3231 4984 1208 75.5 78.7 0.9 0 1 25.2 2397 3767 1042 57.0 64.7 2.5 1	12.	6.5			3376 (31)	5948	1546 (31)	0.06	0.96	0.4	0.1	0.1	0.1	2.4	1.2
0 31.2 b 3266 b 5568 b 1467 b 84.4 b 91.1 b 0.2 b 0. 5 28.7 b 3677 b 5562 b 1364 b 84.2 b 84.6 b 0.9 b 0. 2 23.3 b 4323 b 5327 b 1202 b 80.6 b 74.6 b 0.9 b 0. 9 29.3 b 3231 b 4984 b 1268 b 75.5 b 78.7 b 0.9 b 0. 1 25.2 b 2397 b 3767 b 1042 b 57.0 b 64.7 b 2.5 b 1.5 b 1.2 b	17.6	9	41.9	28.1	3761	5821	1489	88.1	92.4	0.7		1.5	0.4	3.4	2.3
5 28.7 3677 5562 1364 84.2 84.6 0.9 0.9 2 23.3 4323 5327 1202 80.6 74.6 0.9 0. 9 29.3 3231 4984 1268 75.5 78.7 0.9 0. 1 25.2 2397 3767 1042 57.0 64.7 2.5 1.	6.2	6.2	58.0 (55)	31.2 (55)	3266	5568	1467	84.4	91.1			0.3	0.7	4.6	3.7
2 23.3 4323 5327 1202 80.6 74.6 0.9 0.9 9 29.3 3231 4984 1208 75.5 78.7 0.9 0. 1 25.2 2397 3767 1042 57.0 64.7 2.5 1.	23.				3677	5562	1364			6.0		2.3	9.0	10.9	1.3
9 29.3 3231 4984 1268 75.5 78.7 0.9 0. 1 25.2 2397 3767 1042 57.0 64.7 2.5 1.	19.	٠. ت			4323	5327	1202		74.6		0.1	1.6	1.3	∞ ‰	3.6
1 25.2 2397 3767 1042 57.0 64.7 2.5 1.	16	L-			3231	4984	1268		78.7			1.4	0.4	8.4	7.0
	13	67	52.1		2397	3767	1042	57.0	64.7	2.5	1.8	2.8	2.5	14 0	t 8

Note.—Subscript numbers indicate number of tests when different from that shown in column "Number of Tests." See "Variability of Timber" page 14.

TIMBERS	
AVERAGE STRENGTH VALUES FOR STRUCTURAL TIMBERS	FERIAL
FOR	D MAT
VALUES	AIR-SEASONED MATERIAL
STRENGTH	AIR-S
AVERAGE	

1½ In. and None 1.6 DVer 0 0 Vol. III 6 Less 1½ In. than 0 00 00 0 19 Knots in Stringers Tested 18 17 9 1,2 In. and None None 2 9 over AQ. 20 00 83 10 0 C 0 0 0 Vol. 11/2 In. None Less than 2 9 2 00 00 0 0 0 None None 1/2 In. and over 0.1 0.1 9 None None Vol. Less than ½ In. None None 10 3 4 00 00 10 0 0 Elasticity. Relative Stiffness based on Modulus Fir=100 Per Cent per cent 00 Forest Service Bulletin 108 C 9 0 ~ 9 ₹ 90 110 104 108 95. 84. Relative based on Modulus Per Cent Rupture. Douglas Fir = 100per cent 8 10 9 8 87 Of, 88 86 91 64. 82 000 lbs. per Sq. In. of Elas-ticity 641 720 30) 561 of Rupture Modulus Lbs. 7142 3259 3534 1573 υż at Elastic Limit Fiber Sq. In. Taken from II. 5186 Cbs. (6) 4828 (30) 3706 3904 3747 3643 2928 Weight Cu. Ft. Oven-8 Lbs. 00 07 38 29 22 Moisture Per Cent 9 00 4 0 16 17 per -1 r) 9 00 9 No. of lests 4 Cross Section under Test Inches 8x16 8x14 5x12 8x16 8x16 6x16 8x16 8x12 8x16 6x12 7x 9 (N) TABLE Western **Famarack** Jouglas Fir Lobiolly Pine Western Redwood Norway Jong-leaf Pine Short-leaf Pine

Subscript numbers indicate number of tests when different from that shown in column "Number of Tests." "Variability of Timber" page 14. Note.

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PACIFIC COAST WOODS

of knots, therefore approximately 30 per cent of the Douglas fir stringers, car sills and joists were chosen with knots in the tension face which materially affected the strength. Such timbers should not be included in establishing strength values for any species. No stringers were used in tables 1 and 2 in which the cross section was less than 60 square inches.

AVERAGE STRENGTH VALUES FOR STRUCTURAL TIMBERS (Grade I, Tentative Grading Rules, U. S. Forest Service)

GREEN MATERIAL

Results taken from U. S. Forest Service Bulletin 108, Page 65, TABLE 3

Species	No. of Tests	Fiber Stress at Elastic Limit per Sq. In.	Modulus of Rupture per Sq. In.	Modulus of Elasticity per Sq. In.	Relative Strength based on Modulus of Rupture. Douglas Fir =100 per cent Per Cent	Relative Stiffness based on Modulus of Elasticity. Douglas Fir =100 per cent
Douglas Fir. Longleaf Pine. Loblolly Pine. Shortleaf Pine. Western Hemlock Western Larch Tamarack Redwood. Norway Pine.	81 17 45 35 26 45 9 21	4402 3734 3513 3318 3689 3662 3151 4031 3082	6919 6140 5898 5849 5615 5479 5469 4932 4821	1643 1463 1535 1525 1481 1365 1276 1097 1373	100.0 88.7 85.3 84.5 81.1 79.2 79.0 71.3 69.6	100.0 89.0 93.4 92.8 90.2 83.1 77.7 66.8 . 83.6

Note.—See "Variability of Timber" page 14.

Table 3 probably shows the best available data published in any Government bulletin for comparing the strength of different species of structural timber. The data in this table are taken from U. S. Forest Service Bulletin No. 108, page 65. This table shows results of tests on a large number of stringers of different species graded by the tentative grading rule of the U. S. Forest Service. All these timbers were of practically the same grade. The results show Douglas fir to be the strongest wood with a modulus of rupture of 6,919 pounds per square inch. This value is based on 81 tests of full size bridge stringers. The modulus of elasticity for the same set of stringers is 1,643,000 pounds per square inch.

HORIZONTAL SHEAR. There seems to be an impression among those unfamiliar with Douglas fir that this wood is not capable of developing a high unit stress in horizontal shear. The erroneous impression has come largely from comparing the shearing stress developed in Douglas fir beams tested on long spans and in many

cases under center loading, with similar shearing stresses developed in timbers of other species tested on shorter spans under third point loading. Since the horizontal shear developed depends on the maximum load, it is very clear that a higher shear will be developed in beams tested under third point or uniform loading than in those tested under center loading. Due to this fact the horizontal shearing stress developed in Douglas fir stringers tested under center loading should not be compared to that developed in stringers of other species tested under third point loading.

Tables 4 and 5 show the horizontal shear developed in 8"x16"x16" Douglas fir bridge stringers tested under one-third point loading on a 15-foot span. These results were obtained from the Seattle Timber Testing Laboratory of the U. S. Forest Service and they do not appear in any other publication in the form here shown. The results are very significant and show that Douglas fir is capable of resisting high horizontal shearing stresses.

HORIZONTAL SHEAR DEVELOPED IN 53—8"x16"x16' DOUGLAS FIR BEAMS—GREEN MATERIAL

Tested on a 15-foot Span Under 1/3 Point Loading

Data furnished by U. S. Forest Service from results of tests made at
the Seattle Timber Testing Laboratory.

TABLE 4

Grade	No. of Tests	Maximum Horizontal Shear Developed per Sq. In.		St	ar Developed ringers Failing in prizontal She per Sq. In.	ng
		Lbs.	Shear	Average Lbs.	Maximum Lbs.	Minimum Lbs.
Clear and Select	25 15 13	405 404 330	3 8 1	471 425 371	474 476 371	468 391 371

Table 4 shows results for green stringers and table 5 gives similar results for air seasoned material. Of 53 green stringers tested 25 were of clear and select grades, 15 merchantable and 13 common. The grading rule used in grading these timbers was the export rule of the West Coast Lumber Manufacturers' Association. Of the 25 stringers of clear and select grades, 3 failed in horizontal shear at an average stress of 471 pounds/sq. inch. The maximum was 474 and the minimum 468 pounds/sq. inch. Eight of the 15 merchantable sticks failed by horizontal

shear at an average stress of 425 pounds/sq. inch. The maximum was 476 and the minimum 391 pounds/sq. inch.

HORIZONTAL SHEAR DEVELOPED IN 19—8"x16"x16" DOUGLAS FIR BEAMS—AIR-SEASONED MATERIAL

Tested on a 15-foot Span Under 1/3 Point Loading

Data furnished by U. S. Forest Service from results of tests made at the Seattle Timber Testing Laboratory.

TABLE 5

Grade	No. of Tests	Maximum Horizontal Shear Developed	Number Failing in Horizontal	St	ar Develope ringers Faili in orizontal She per Sq. In.	ng
		per Sq. In. Lbs.	Shear	Average Lbs.	Maximum Lbs.	Minimum Lbs.
Clear. Merchantable. Common.	7 6 6	444 386 385	7 3 5	444 375 384	615 488 427	364 256 351

Table 5 shows similar results for 19 air seasoned stringers.

Of 16 full sized green bridge stringers recently tested at Portland by the Bureau of Standards (see table 16, page 43) 9 failed by horizontal shear developing an average stress of 426 pounds/sq. inch with a maximum of 503, and a minimum of 381 pounds/sq. inch.

CRUSHING STRENGTH OF LARGE SIZES

Tables 6 to 8 show the maximum compressive strength of short columns of Douglas fir, western hemlock, and western larch. In these tables the material has been grouped into four classes, namely, clear specimens, specimens containing knots ½" in diameter or less, specimens containing knots ½" to 1½" in diameter, and specimens containing knots larger than 1½" in diameter. Results are shown for both green and air seasoned material except in the case of Douglas fir.

In the mining districts of the United States both round and square timbers are used. In an effort to show the relative value of timbers used for this purpose, table 9 has been prepared. This table shows the maximum crushing strength in pounds per sq. inch for mine timbers of a number of western species. The strength of a number of the Rocky Mountain species which are used extensively in mine work is also given. This comparison shows the great superiority of the Coast woods over those grown in the high altitudes.

AVERAGE STRENGTH VALUES FOR DOUGLAS FIR IN COM-PRESSION PARALLEL TO GRAIN

6"x6"x18" POSTS

Results taken from U. S. Forest Service Bulletin 88, Page 33, Table 6.

TABLE 6

GREEN MATERIAL

	Rings		Moisture Content		ht per 3 Foot	Com- pressive Strength at Elastic	at Maxi-	Modulus
Material	No. of Tests	per Inch		As Tested	Oven- dry	Limit per Sq. In.	Load per Sq. In.	per Sq. In.
			Per Cent	Lbs.	Lbs.	Lbs.	Lbs.	1000 lbs.
Clear	130	11.8	30.4	38.1	29.2	3099	3918	1321
Pin knots (½" or less in diameter) Standard knots (½"	62	10.4	31.6	37.7	28.6	2931	3698	1401
to 1½" in diameter)	227	9.0	30.9	37.8	28.9	2708	3386	1187
Large knots (over 11/2" in diameter)	97	9.4	29.9	38.0	29.3	2406	3062	940

AVERAGE STRENGTH VALUES FOR WESTERN HEMLOCK IN COMPRESSION PARALLEL TO GRAIN

6"x6"x24" POSTS

Results taken from U. S. Forest Service Bulletin 115, Page 21, Tables 5 and 6.

TABLE 7

GREEN MATERIAL

Material	No. of Tests	Rings per Inch	Moisture Content		ht per c Foot Oven- dry	pressive	at Maxi-	Modulus
			Per Cent	Lbs.	Lbs.	Lbs.	Lbs.	1000 lbs.
Clear	46	15.7	48.5	41.2	27.7	3018	3507	1676
Pin knots (½" or less in diameter) Standard knots (½"	12	12.5	48.4	38.1	25.6	2880	3396	1670
to 1½" in diameter)	11	15.7	42.0	36.6	25.8	2838	3197 -	1624
1½" in diameter)	13	14.6	42.0	37.9	26.8	2590	2901	1364

AIR-SEASONED MATERIAL

Clear	64	18.6	18.4	32.9	27.8	5176	5952	2109
Pin knots (½" or less		40.0	40.0	00.0	00.4	4500	0051	1820
in diameter)	8	18.2	18.6	33.3	28.1	4523	6051	1756
Standard knots (1/2"								
to 11/2" in diam-	25	18.1	18.8	34.0	28.6	4556	5516	2217
eter)	25	10.1	10.0	04.0	20.0	4990	9910	2214
Large knots (over	5	14 7	19.3	35.9	30.1	4248	5150	2215
1/2 III (Hameter)	U	17.7	10.0	00.0	00.I	TUTO	0.100	2210

AVERAGE STRENGTH VALUES FOR WESTERN LARCH IN COMPRESSION PARALLEL TO GRAIN

6"x6"x24" POSTS

Results taken from U. S. Forest Service Bulletin 122, Page 20, Tables 5 and 6

TABLE 8

GREEN MATERIAL

		Rings			ht per	at Elastic	at Maxi- mum	Modulus
Material	No. of Tests	per Inch	Content	As Tested	Oven- dry	Limit per Sq. In.	Load per Sq. In.	Sq. In.
			Per Cent	Lbs.	Lbs.	Lbs.	Lbs.	1000 lbs.
Clear	51	25.4	52.3	44.8	29.3	2635	3630	1528
Pin knots (½" or less in diameter) Standard knots (½"	20	21.7	48.1	42.9	28.9	2955	3772	1820
to 1½" in diameter)	28	24.2	44.5	39.2	27.0	2577	3226	1521
1½" in diameter)	8	23.8	46.2	40.5	27.8	2569	3069	1442
	A	IR-SEA	SONE	D MAT	ERIA	_		
Clear	67	26.5	15.0	36.1	31.3	3801	6253	1769
in diameter) Standard knots (½" to 1½" in diam-	69	24.3	15.8	35.5	30.7	3165	5994	2025
eter)	49	22.3	15.6	33.1	28.6	2553	4921	1500
1½" in diameter)	8	22.9	15.5	31.8	27.5		4520	

STRENGTH OF CLEAR WOOD

Table 10 shows results of tests on small, clear, green specimens. The values given are averages and give a fair idea of the strength of the various species in this form of material.

The following diagram is taken from U. S. Forest Service Bulletin 88 and may be used in estimating the strength of small. clear specimens which have seasoned to a point where strength begins to increase. For example, U. S. Forest Service Bulletin 108, page 71, shows the strength of small, clear Douglas fir beams 2"x2" in cross section containing 19 per cent moisture to be 10,378 pounds/sq. inch. If similar 2"x2" beams of Douglas fir containing 16 per cent moisture had been tested the modulus of rupture should have been 10,378x12,400=13,840 pounds/sq. inch.

Any other corrections in strength values may be made in a similar manner.

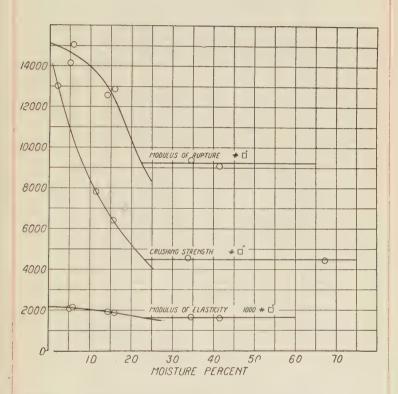


Diagram 1. Relation between moisture content and strength values for small clear specimens of Douglas Fir.

AVERAGE MAXIMUM CRUSHING STRENGTH FOR MINE TIMBERS* IN COMPRESSION PARALLEL TO GRAIN-GREEN MATERIAL

5 Results taken from U. S. Forest Service Bulletin 88, Page 33, Table 6, and U. S. Dept. of Agriculture, Bulletin 77, Page Table 2.

TABLE 9

Relative Strength. Pacific Coast Douglas Fir= 100 per cent	Per Cent	100 0 73.7 55.4 55.4 55.3 50.0 47.3
Maximum Crushing Strength per Sq. In.	Lbs.	3500 2580 1940 1920 1750 1657
Form of Material		Square Timber Round Timber Round Timber Round Timber Round Timber Round Timber
Locality of Growth		Washington and Oregon Rocky Mountain Region
No. of Tests	!	516 10 10 10 11 10
Grade		All Grades. All Grades. All Grades. All Grades. All Grades All Grades All Grades
કરાંગમાં દ્		Douglas Fir Wastern Valen Fine Alpine Fir Lodgepole Pine Englemann Spruce Bristle-cone Pine.

Square timbers-6"x6"x18" posts. Round timbers-6' length, 5" top diameter, Note. -- See "Variability of Timber" page 14

AVERAGE STRENGTH VALUES FOR SMALL CLEAR PIECES GREEN MATERIAL

Results taken from U. S. Forest Service Publications-Bulletins 88 and 108, Circular 213.

TABLE 10

Shear Strength Grain of Ovendry	Weight. Based on Shearing Modulus of Strength Rupture oer Sq. In. per Sq. In.	Lbs. Lbs.	765 290 1007 262 704 270 630 270 7700 254 7700 317 668 227 589
Com- pression to Grain		Lbs.	570 491 400 569
Com- pression to Grain	Crushing Compress-Strength at Bastic Load Limit per Sq. In. per Sq. In.	Lbs.	4100 4280 3392 3392 3340 3980 3190 2504
b0	Modulus of Elasticity per Sq. In.	1000 lbs.	1596 1662 1395 1428 1440 1310 1061 1141 960
Static Bending	Modulus of Rupture per Sq. In.	Lbs.	8350 8630 7710 7294 7870 7251 6980 6820 5173
52	Fiber Stress at Elastic Limit per Sq. In.)	Lbs.	5463 5090 4350 4406 4274 4774 3875 2808
	Weight per Cu. Ft. Ovendry	Lbs.	20228317
	Rings per Inch		11.0 13.6 13.6 12.1 2.6.2 19.1 14.0
	Moisture	Per Cent	31.0 63.0 51.7 70.9 46.2 75.5 38.8
	No. of Tests		. 255.0 255.0 44.0 189.0 1157.0 182.0 183.
	Species		Douglas Fir. Longlas France, Shortleaf Prince, Weekern Henlook Uoblolly Prince, Weekern Larch Weekern Larch Tamaraok Norway Prince

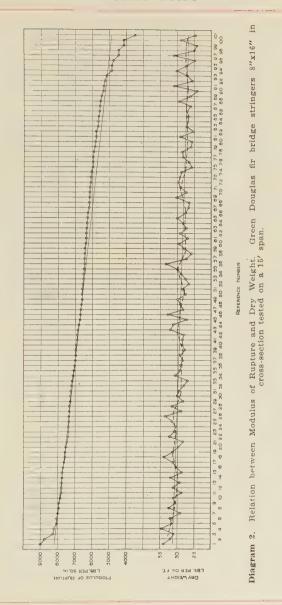
* Approximation.

Note.-See "Variability of Timber" page 14.

GRADING RULES FOR STRUCTURAL TIMBERS

The dry weight of small clear specimens, particularly for wood containing little or no resinous substance, is a definite indication as to the strength of the wood fiber. This fact is shown for Douglas fir in U.S. Forest Service Bulletin 108, figure 15, page 39; with an increase in dry weight of from 19 to 36 pounds per cubic foot, there is an accompanying increase in strength (modulus of rupture) of from 5,500 to 10,500 pounds per square inch. These figures indicate increases of 47.2 and 47.7 per cent respectively for weight and strength based on the maximum values. The question now arises, does this same law hold for timbers of standard structural sizes? In order to get some data on this point, diagrams 2 and 3 have been prepared. These diagrams are obtained from the results of tests of Douglas fir bridge stringers in which defects did not cause first failure. The strength values are taken from U.S. Forest Service Bulletin 108. In each of these diagrams the timbers have been arranged in the order of their strength (modulus of rupture), and the corresponding dry weights in pounds per cubic foot plotted in each case. Diagram z shows results of tests of green Douglas fir timbers (8"x16"x16"), and diagram 3 shows similar results for air seasoned Douglas fir stringers. Diagram 2. "Green Timbers." shows that with an average increase in strength of from 4,800 to 8,250 pounds per square inch, there is an average increase in dry weight of from 26.7 to 31.8 pounds per cubic foot. These figures indicate that for an increase in strength of 41.9 per cent there is an increase in weight of 16.1 per cent. Diagram 3, "Air Seasoned Timbers," shows that with an average increase in strength of from 5,350 to 8,760 pounds per square inch, there is an average increase in dry weight of from 24.2 to 30.7 pounds per cubic foot.

These figures indicate that for an increase in strength of 39.0 per cent, there is an increase in weight of 21.2 per cent. In both diagrams 2 and 3 the dry weights often vary almost to extremes when no appreciable variation is found in the strength. In diagram 3 the last portion of the curve shows a marked increase in weight, which is accompanied by a very decided drop in strength. Diagram 2 shows no drop in weight over the last quarter of the curve where the drop in strength is very material. In other words, the relation found between dry weight and strength is erratic, and the dry weight cannot be depended upon



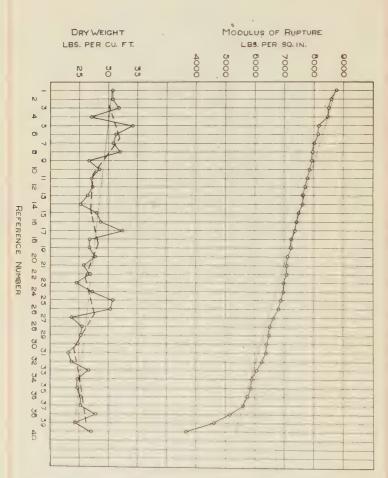


Diagram 3. Relation between Modulus of Rupture and Dry Weight. Airseasoned Douglas fir bridge stringers 8"x16" in cross-section tested on 15' span.

to forecast the strength of structural timbers containing defects to any great degree of certainty.

Exhaustive tests show that good quality timbers exhibit high strength values both before and after seasoning. Some species show a greater tendency to check in seasoning than others, and consequently are apt to show less gain in strength and sometimes a loss due to seasoning. Douglas fir and western hemlock exhibit an average tendency to check, but tests show that timbers of these species maintain their original green strength after seasoning plus some additional strength, depending upon the character of the original material and the amount of checking which occurs due to seasoning.

For reasons, as shown above, it is not practicable to go to the refinement of determining the true density of individual timbers. It is sufficient to examine a timber and see that it has reasonable density based on the amount of summerwood and that it is free from injurious defects.

The standard grade used on the Pacific Coast at the present time to secure high grade structural timbers is "Selected Common." This grade covers timbers selected from the grade known as No. 1 Common as shown below.

"No. 1 COMMON"

"This grade shall consist of lengths 8 feet and over (except ! shorter lengths be ordered) of a quality suitable for ordinary constructional purposes. Will allow small amount of wane, large sound knots, large pitch pockets, colored sap one-third the width and one-half the thickness, slight variation in sawing and slight streak of solid heart stain."

"Defects to be considered in connection with the size of the piece." $\label{eq:connection}$

"Discoloration through exposure to the elements or season checks not exceeding in length one-half the width of the piece shall not be deemed a defect excluding lumber from this grade, if otherwise conforming to the grade of No. 1 Common."

"SELECTED COMMON"

"This is a grade selected from the grade of No. 1 Common, and shall consist of lumber free from defects that materially impair the strength of the piece, well manufactured and suitable for high class constructional and structural purposes or the purpose for which it is intended, including bridge timbers, floor joists, ship timbers, factories and warehouses, designed to carry heavy loads, etc."

The "Selected Common" grade will secure good material for general constructional purposes. There is a demand, however, for a rule which will make a still closer separation of timbers, eliminating all pieces not possessing high strength values.

In formulating the following proposed grading rules for "Selected Structural Douglas Fir Timbers" an effort has been made to form a rule which is simple, practicable and fair to both producer and consumer. Above all it has been the aim by means of this rule to obtain a grade of timber which is suitable for the highest class of construction work and which will admit only timbers of high strength values. There is a demand for such a rule and it will be possible with this rule to use a higher safe fiber stress than that in use at the present time for timbers of the ordinary grades. This rule does not in any way take the place of other rules of the West Coast Lumbermen's Association, but it is intended for use in securing particularly strong timbers. Careful consideration in forming the rule has been given to defects of the common type and to the influence of quality of the wood fiber. The position of knots in stringers bears a very close relation to the strength of the piece, therefore special attention has been given to this subject. Figure 3 shows a beam divided into three volumes. Volumes 1 and 2 are portions in which maximum fiber stresses are developed and volume 3 is the portion of low tensile and compressive stresses.



Fig. 3. Division of stringer into volumes for considering position of knots.

Stringers of the highest grade must also be composed of dense strong fiber and free from all injurious defects. With these points in mind, the following specification has been prepared which allows fairly large knots in volume 3 but restricts to 1142" the size of the knots in volumes 1 and 2.

SELECTED STRUCTURAL DOUGLAS FIR SPECIFICATION FOR BRIDGE AND TRESTLE TIMBERS PROPOSED RULE

- 1. Definitions. The following definitions are used in connection with this grading rule:
- (a) Annual Ring. Each annual ring is composed of two distinct types of wood structure i. e., the porous, light colored and light weight springwood formed during the first part of the growing season and the hard, dense and darker colored summerwood formed during the latter part of the growing season.
- (b) Summerwood. Summerwood is the hard, dense portion of the annual ring. It is darker in color than the more porous springwood.
- (c) Sound and Tight Knot. A sound and tight knot is one which is solid across its face and which is as hard as the wood surrounding it; and is so fixed by growth or position that it will retain its place in the piece.
- (d) Encased Knot. An encased knot is one whose growth rings are not intergrown and homogeneous with the growth rings of the piece in which it occurs. The encasement may be partial or complete; if intergrown partially or so fixed by growth or position that it will retain its place in the piece, it shall be considered a sound and tight knot.
- (e) Loose Knot. A loose knot is one not firmly held in place by growth or position.
- (f) Rotten Knot. A rotten knot is one not as hard as the wood surrounding it.
 - (g) Measurement of Knots.

In Beams the diameter of a knot on the narrow or horizontal face shall be taken as its projection on a line perpendicular to the edge of the timber. On the wide or vertical face, the smallest dimension of a knot is to be taken as its diameter.

In Columns the diameter of a knot on any face shall be taken as its projection on a line perpendicular to the edge of the timber.

- (h) Diagonal Grain. (Including cross and spiral grain.) Diagonal grain is grain not parallel with all the edges of the piece.
- (i) Dense Douglas Fir. Shall show on either one end or the other an average of at least 6 annual rings per inch or 18 rings in 3 inches and at least 33 1/3 per cent summerwood, as measured

over the third, fourth and fifth inches on a radial line from the pith, for girders not exceeding 20" in height, and for columns 16" square or less. For larger timbers the inspection shall be made over the central 3 inches on the longest radial line from the pith to the corner of the piece. Wide ringed material excluded by the above will be accepted provided the amount of summerwood as above measured shall be at least 50 per cent.

In case where timbers do not contain the pith, and it is impossible to locate it with any degree of accuracy, the same inspection shall be made over 3 inches on an approximate radial line beginning at the edge nearest the pith.

The radial line chosen shall be representative. In case of disagreement between purchaser and seller as to what is a representative radial line the average summerwood and number of rings shall be the average of the two radial lines chosen.

2. GENERAL REQUIREMENTS.

- (a) Shall contain only Deuse Douglas Fir timbers as defined in paragraph (i).
- (b) Shall consist of lumber, well manufactured, square edge and sawed standard size; solid and free from defects such as ring shakes and injurious diagonal grain; loose or rotten knots; knots in groups; decay; pitch pockets over 6 inches long or % inch wide or other defects that will materially impair its strength.
- (c) Occasional variation in sawing not to exceed $\frac{1}{4}$ inch scant at time of manufacture allowed.
- (d) When timbers 4"x4" and larger are ordered sized, they will be $\frac{1}{2}$ inch less than rough size, either S1S1E or S4S, unless otherwise specified.

STRINGERS, GIRDERS AND DEEP JOISTS. Shall show not more than 15 per cent of sap on each of the four sides, measured across the sides anywhere in the length of the piece. Shall not have in volumes 1 and 2 knots greater in diameter than ½ the width of the face in which they occur with a maximum of 1½ inches in diameter. Shall not have in volume 3 knots larger than 1/3 the width of the face in which they occur with a maximum of 3 inches in diameter. Knots within the center half of the span shall not exceed in the aggregate the width of the face in which they occur. Shall not permit diagonal grain in volumes 1 or 2 with a slope greater than one in twenty. When stringers are of two span length they shall be considered as two separate pieces

PACIFIC COAST WOODS

and the above restrictions applied to each half. The inspector shall place his stamp on the edge of the stringer to be placed up in service.

Caps and Sills. Selected structural Douglas fir shall show not more than 15 per cent of sap on each of the four sides, measured across the sides anywhere in the length of the piece, and shall be free from knots larger than ¼ the width of the face in which they occur with a maximum of 3 inches in diameter. Knots shall not be in groups.

Posts. Selected structural Douglas fir shall show not more than 15 per cent of sap, measured across the face anywhere in the length of the piece, and shall be free from knots larger than ½ the width of the face in which they occur with a maximum of 3 inches in diameter. Knots shall not be in groups,

LONGITUDINAL STRUTS OR GIRTS. Selected structural Douglas fir shall show no sap on one face; the other face and two sides shall show not more than 15 per cent of sap, measured across the face or side anywhere in the piece, and shall be free from knots over 2 inches in diameter.

LONGITUDINAL X-BRACES, SASH BRACES AND SWAY BRACES. Selected structural Douglas fir shall show not more than 15 per cent of sap on two faces and four square edges, and shall be free from knots over 2 inches in diameter.

Branding. The inspector shall brand each timber which conforms to the above requirements "Selected Structural Douglas Fir."

RECOMMENDED WORKING UNIT STRESSES

The following table shows the working stresses recommended in the latest building codes of the cities of Seattle, Wash., and Portland, Oregon. The City of Seattle Building Code was issued in 1914, while that of the City of Portland has more recently been revised.

WORKING UNIT STRESSES RECOMMENDED IN SEATTLE AND PORTLAND BUILDING CODÉS

TABLE 11

		Extreme Fiber	Com-	Com-	Sh	ear	.
Species	City	Stress and Tension with Grain	pression Parallel to Grain	pression across Grain	Horizontal in Beams	Parallel to Grain Direct	Tension across Grain
Douglas Fir	Seattle Portland	1600 1800	1600 1600	400 400	150 175	200 240	100
Western Hemlock	Seattle Portland	1400 1500	1400 1500	350 290	130 120	180 180	75

After making a careful study of the structural properties of Douglas fir and western hemlock, the following values are recommended by the West Coast Lumbermen's Association for selected structural Douglas fir timbers:

WORKING UNIT STRESSES RECOMMENDED BY WEST COAST LUMBERMEN'S ASSOCIATION

TABLE 12

	Class of	Extreme Fiber	Com- pression	Com- pression	She	ear	Tension
Species	Construction		Parallel to Grain	across Grain	Horizontal in Beams	Parallel to Grain Direct	across Grain
	Protected						
T) 1 Y	Structures.	1800	1600	400	175	240	100
Douglas Fir	Highway Structures Railway	1500	1330	330	150	200	85
	Structures	1200	1070	270	120	160	65
	Protected				,		
*** ,	Structures	1500	1500	310	120	180	75
Western Hemlock	Highway Structures Railway	1250	1250	260	100	150	65
	Structures	1000	1000	210	80	120	50

KILN DRYING DOUGLAS FIR

Kiln drying is one of the important phases of lumber manufacture. Of late years a great many improvements have been made in the construction of kilns, and in the methods of piling, heating and ventilating. Some woods are much more difficult to kiln dry satisfactorily than others, but the general principles herein mentioned apply to all woods, and particularly to Pacific Coast species.

- 1. The heat should be carefully regulated. Extremely high temperatures cause the wood to become to brittle.
- 2. The piling should be such as to enable the heat to enter the wood uniformly, and the use of wide stickers should be avoided. Vertical piling has done a great deal toward the elimination of checking and warping.
- 3. Draughts of outside air and too much ventilation cause the lumber to check and warp. Steam baths before drying greatly aid in preventing checking, warping and case hardening.

Pacific Coast woods present no serious problems in kiln drying, and with the perfected methods now in use a thoroughly satisfactory product is obtained.

All finish lumber should be properly kiln dried before being placed in a building. Correct methods of kiln drying prevent the resin from oozing through the varnish and also largely eliminate shrinking and swelling, and aid in securing high class finish.

Dimension lumber is now dried for uses where dry material is desirable. No serious difficulties are experienced in drying dimension stock up to three inches in thickness.

CREOSOTING DOUGLAS FIR

The creosoting of Douglas fir has been practiced on the Pacific Coast for more than 25 years. The creosoting of such forms as lumber, piling and paving blocks has proved an entire success. Douglas fir is a hard wood to treat, however, and it has required a great deal of study and experimenting to produce thoroughly satisfactory results. There are two general classes of creosoted material, as follows:

- 1. Wood which must retain its full strength after treatment.
- 2. Wood in which the strength is not so important, the real problem being that of protection against wood-destroying agents.

The second class of material mentioned has caused no trouble. The difficulty has been with the first class.

Both the steaming and boiling processes of treatment have been employed in creosoting Douglas fir. The steaming process will produce a good penetration, probably slightly better than the boiling, but it also appears to weaken the timber slightly more than the boiling process. In such forms as bridge stringers and ties, treatments sufficiently severe to obtain satisfactory penetrations have caused a material loss in strength. The problem, therefore, which has confronted the industry on the Pacific Coast has been that of developing a process of creosoting these forms which would secure a thorough penetration and at the same time would not cause a material loss in strength.

From experiments which have been made it has been shown that high temperatures and high pressures in these treatments are largely responsible for the loss in strength of the wood, which under such treatments amounted to as much as 33 to 35 per cent in bridge stringers. Even greater losses than these have occurred in the treatment by the above processes of Douglas fir ties. These treatments in the past have been applied about as follows:

BOILING PROCESS

The timbers were placed in the retort in a green condition, and boiled in creosote oil under atmospheric pressure for 22 to 24 hours at a temperature ranging from 230° to 260° Fahr. This boiling period was used to season the timber and prepare it for receiving the oil. After the boiling period was completed, pressure was applied beginning with zero and rising as high as 145 to 185 pounds per square inch. The pressure was continued over a period of 4 to 6 hours, at a temperature of approximately 210° to 230° Fahr. By this method 10 to 14 pounds of oil per cubic foot were injected into the wood.

STEAMING PROCESS

The timbers were placed in the retort in a thoroughly green condition and steamed at 90 pounds per square inch for 4 to 7 hours at a temperature of approximately 325° to 335° Fahr.. A vacuum or approximately 20 inches was then applied for 18 to 20 hours at a temperature of about 220° Fahr.. At the end of the vacuum period creosote oil was introduced and pressure applied, rising from zero up to 160 pounds per square inch. This pressing period was continued for 2 to 4 hours at a temperature of approximately 208° Fahr.. Ten to 14 pounds of oil per cubic foot were usually injected by this process.

It will be noted that in both the above processes high temperatures were applied. The temperature used in the boiling process was lower than that used in the steaming, but was applied for a longer period. The steaming process employed a higher temperature for a shorter period of time.

In recent experiments both temperature and pressure have been reduced and the vacuum made to take a more important part in the process. The most successful treatment yet devised for treating bridge stringers and similar forms without loss in strength is that of "boiling under a vacuum." When green timbers are creosoted by this method the treatment requires approximately 26 hours, and is in general, as follows:

BOILING UNDER A VACUUM PROCESS

The timbers are placed in the retort and creosote oil introduced at a temperature of 160° to 180° Fahr. Heat is applied and the temperature of the oil gradually raised to 190° Fahr. and held at that temperature for 5 to 6 hours, a sufficient length of time to warm the timbers through. When the timbers are thoroughly warmed a vacuum of 24 to 27 inches is drawn on the oil, still holding a temperature of 190° Fahr. This vacuum is

drawn through an overhead pipe extending from the top of the retort for 36 feet vertically into the air and returning to the condenser. The purpose of this pipe is to prevent the creosote oil from boiling over into the condenser. This vacuum is stated at 16 to 18 inches, and as the timber seasons is gradually raised to 24 to 27 inches. The full period of vacuum is 12 to 16 hours. It is continued until the rate of seasoning of the timber is 1/10 pound of water per cubic foot of wood perhour. After this finished rate of seasoning is reached the vacuum is broken and pressure on the oil started, which rises as high as 120 to 135 pounds per square inch, and continues over a period of 4 to 6 hours. The temperature of the oil during the pressure period drops from 190° to 180° Fahr. By this process 10 to 14 pounds of oil per cubic foot may be pressed into the wood.

This method of treatment is a slight modification of the Boulton process and at the low temperatures used seasons the wood even better than the old boiling process, which employed so much higher temperatures. Timbers treated by the method of boiling under a vacuum apparently receive the creosote oil more readily than timbers treated under the old boiling process.

Bridge Stringers. In order to carry the test still further and to determine the effect of this treatment (Boiling Under a Vacuum) on the strength of the wood, two shipments of full-sized bridge stringers were selected, and treated in four different charges. These stringers were of three sizes, 7"x14"x28'. 7"x16"x30' and 10"x14"x28'. After treatment the stringers were shipped to Portland, Oregon and tested by the Bureau of Standards. The results of the tests are shown in the following report:

City of Portland Department of Public Works Bureau of Standards

Report of bending tests of creosoted and natural stringers. Tested for O. P. M. Goss, consulting engineer for the Association of Creosoting Companies of the Pacific Coast.

PURPOSE. The purpose of these tests was to determine the effect of creosoting by the "Boiling Under a Vacuum" process on the strength of Douglas fir bridge stringers in transverse bending.

MATERIAL. The material consisted of merchantable grade Douglas fir stringers of the following sizes:

9— 7"x14"x28' 3— 7"x16"x30' 5—10"x14"x28'

They were selected so that the two halves of the stringers were of as nearly equal quality as it was possible to obtain.

PACIFIC COAST WOODS

They were then cut in the middle and one-half treated by the above process. Both natural and treated halves were brought to Portland, and tested by the Bureau. The untreated timbers were tested in a thoroughly green condition.

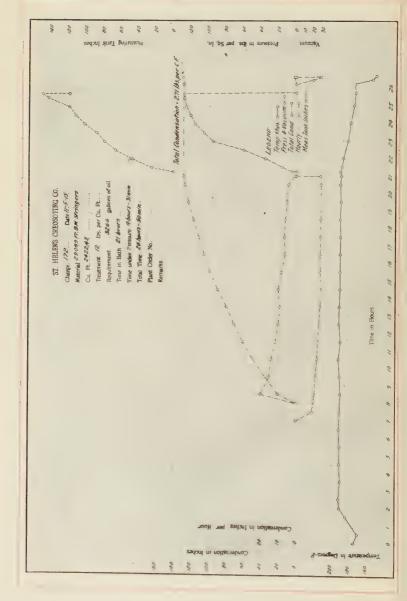
One of the 7"x16"x15' natural stringers and the corresponding treated one gave unusually low results when tested. Both the natural and the treated stringers were cut up into sections and thoroughly examined after test. It was discovered that a heart shake was present in both pieces, the creosote showing plainly along this shake in the treated timber. This stringer failed in shear along this shake at a very low load, atter which this load increased considerably before final rupture of the beam. The result of the tests on these defective stringers are therefore not included in this report, failure being due entirely to this

defect present before treatment.

METHOD OF TEST. The method of testing was identical with that used in previous tests made on structural timbers by the U. S. Forest Service and described in Forest Service Circular No. 38 (Revised). The stringers were tested on a 150,000-pound Universal Riehle machine under third point loading, the load being applied at two points, each one-third the length of the span from the end supports. The 7"x14"x14' and the 10"x14"x14' pieces on a 13-foot span and the 7"x16"15' pieces on a span of 14 feet. The load was applied continuously, the head of the machine descending at the rate of 0.139 inches per minute, and the load increments and corresponding deflections recorded. The manner of failure at maximum load was noted in each case. The strength values were computed from U. S. Forest Service formulae and are therefore comparable with previous tests on structural timber.

After the tests were completed, photographs were made of identification sections taken from each of the natural and treated stringers, except one set which was lost through a misunder-These sections show the quality of the growth in the timbers and the amount of penetration secured in the treated The tables* and diagrams* complete this report. 13 contains results of the tests on the 7"x14"x14' stringers and shows the modulus of rupture or breaking strength of the treated material to be 101.2 per cent that of the natural. Table 14, giving strength values for 7"x16"x15' stringers shows a modulus of rupture for the treated of 101.8 per cent of the corresponding natural. Table 15 shows results of the 10"x14"x14' beams. The untreated material had a slight advantage in breaking strength, the treated being 95 per cent as strong as the natural. Table 16 is a summary of the preceding tables and shows the average modulus of rupture for the treated stringers of all sizes to be 99.2 per cent that of the natural pieces. The following diagrams show the results of the individual tests and a record of the treatment used. The graphs for the natural and corresponding treated stringers are given side by side.

^{*}Refers to tables 13 to 16 and diagrams 6 to 9.



BRIDGE STRINGERS

EFFECT OF CREOSOTING BY BOLLING UNDER A VACUUM ON THE STRENGTH AND STIFFNESS OF DOUGLAS FIR, TREATED GREEN. TIMBERS 7X MX.14. TESTED UNDER \$ POINT LOADING ON A 15 SPAN.

TABLE 13

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89.6 7330 5780 78.9 1970 1730	896 7930 5780 78,9 1970 1730 878 50
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Results of bending tests made on 7"x14"x14" Dougliss fir bridge stringers, natural and ereosoted.

CITY OF FORTLAND, OREGON
DEPARTMENT OF POLIC WORKS
DATE OF TANDANDS
TABUL ATION OF RESULTS
OF TRANSPORE PROMOTED STRUMERS
COMPUTED BY (108)

DEC ,5, 9,5.

BRIDGE STRINGERS

EFFECT OF CREOSOTING BY BOILING UNDER A VACUUM ON THE STRENGTH AND STIFFNESS OF DOUGLAS FIR, TREATED GREEN. TIMBERS 10x14x14. TESTED UNDER 3 POINT LOADING ON A 13 SPAN

TABLE 15

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														DEPA	RTMEN	CITY OF PORTLAND, OREGON ARTMENT OF PUBLIC WC BUREAU OF STANDARDS	DEPARTMENT OF PUBLIC WORKS BUREAU OF STANDARDS	

Results of bending tests made on 10''x14''x14' and 7''x16''x15' Douglas fir bridge stringers, natural and creosoted.

DEC. 15 1015.

TABULATION OF RESULTS
OF TRANSCREE BENNIS ON
NATURAL AND TRATED STRINGERS
COMPUTED BY (0.0)

BRIDGE STRINGERS

EFFECT OF CREOSOTING BY BOILING UNDER A WCUUM ON THE STRENGTH AND STIFFNESS OF DOJGLAS FIR, TREATED GREEN. TIMBERS 7% 4% 4, 7% 6% 5 AND IOXI4X14, TESTED UNDER 3 POINT LOADING ON A 13 TO 14 SPAN,

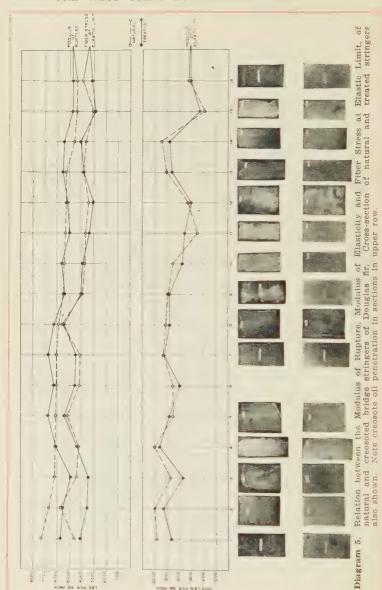
TABLE 16

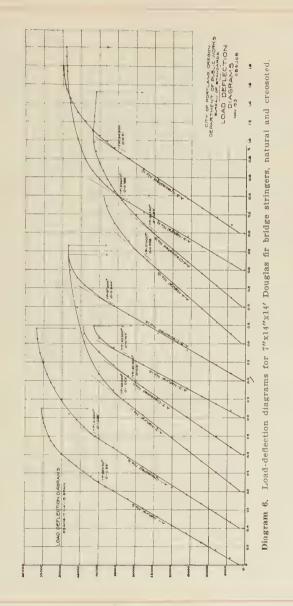
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Σ	u.		z	7330	6700	6210	0619	6.30	6083	6070	5880	5500	5422	5328	5280	5275	4605	4410	4408	5676
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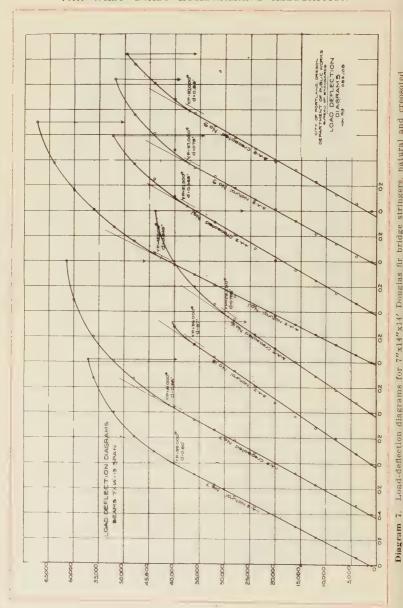
Results of bending tests made on 7"x14"x14', 10"x14"x14' and 7"x16"x15' Douglas fir bridge stringers, natural and creosoted.

TABULATION OF RESULTS
OF TRANSVERSE BENDING ON MATURAL
AND TREATED STRINGERS DEPARTMENT OF PUBLIC WORKS BUREAU OF STANDANDE COMPUTED BY (J.B.B.

DEC 15.1919.







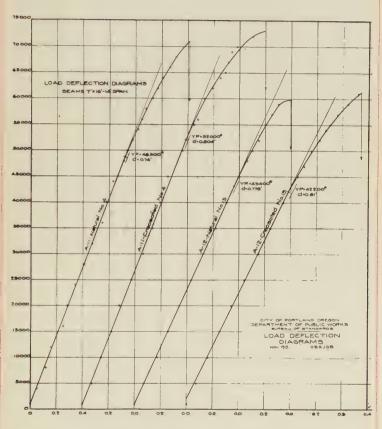


Diagram 8. Load-deflection diagrams for 7"x16"x15" Douglas fir bridge stringers, natural and creosoted,

Diagram 9. Load-deflection diagrams for 10"x14"x14 Douglas fir bridge stringers, natural and creosoted

PACIFIC COAST WOODS

These tests show that the treatment used does not cause any appreciable loss in the strength of full size bridge stringers.

Approved by

Signed R. G. Dieck Signed R. S. Dulin Commissioner of Public Works Chief, Bureau of Standards.

Tables 13 to 16 and diagrams 6 to 9 are part of the above report by the Bureau of Standards, City of Portland.

The results of the above tests are also shown graphically in diagram 5. The untreated timbers were arranged in order of their strength based on the modulus of rupture, and plotted with the strongest timber to the left and the weakest timber to the extreme right of the diagram. Three factors are shown, as follows:

Modulus of Rupture:

Modulus of Rupture;
Fiber Stress at Elastic Limit;
Modulus of Elasticity.

The results of the treated and corresponding natural stringers are plotted on the same vertical line and are very close together for all of these factors. At the bottom of the diagram sections of both the treated and untreated stringers are shown. These sections show the penetration obtained and give an idea of the class of material used in these tests. The minimum penetration was 0.4 inch and the maximum 2.25 inches with an average of approximately 1.2 inches.

The above results are proof that Douglas fir bridge stringers may be effectively creosoted without injuring the strength, a fact which should be of interest to railroads and others consumers of structural timber.

Ties. The volume of lumber which is cut annually into railroad ties is extremely large. There is perhaps no form of timber which is subjected to a more strenuous test than a railroad tie. In the first place, a tie is so placed as to make it subject to attack by fungus. In the second place, a tie is stressed in a direction perpendicular to the grain. Practically no test on wood shows as low unit strength as the test in compression perpendicular to the grain. Therefore, a tie in order to best serve its purpose should at all times retain its natural strength.

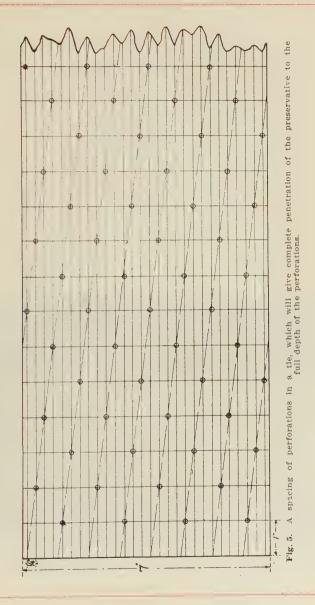
An untreated tie shows its natural strength only up to the point when it begins to decay. The mechanical life of a Douglas fir tie of good grade is at least 15 years, but under conditions found in the ordinary roadbed, this class of ties will decay and become useless in from six to seven years.

In an effort to overcome decay, a great many creosoted Douglas fir ties have been used. These ties, however, were creosoted by the boiling or steaming processes both of which employed high temperatures and produced a weakening of 30 to 40 per cent in the strength of the wood. It is very evident that this weakening was extremely serious. As mentioned before, wood is weak in compression perpendicular to the grain. To make it still weaker by methods of creosoting which injure its strength, is extremely objectionable when the wood is to be used in the form of ties. Many ties which have been treated by the use of high temperatures and placed in the track have shown weakness in resisting the impact of railway traffic. Such ties have shown marked improvement in their durability, but great weakness against mechanical wear.

In view of the above facts, the West Coast Lumbermen's Association has made a careful study of this subject in an effort to solve the difficulties. Two principal points have been held in mind during the experiments made to date:



Fig. 4. A machine used to perforate Douglas fir railway ties in order to better distribute the preservative, thus securing a more effective protection against decay. These perforations make the treatment of the tie possible without the application of high temperatures and pressures.



(1) To prolong the natural life of Douglas fir ties by preservative treatment.

(2) To apply the preservative treatment effectively without

injuring the strength of the wood.

The accomplishment of the above points will produce the desired result, since Douglas fir, in comparison to other woods, is very strong in compression perpendicular to the grain.

In investigating this subject an effort has been made to take advantage of the fact that crossote oil enters wood along the grain with very much greater ease than in any other direction. It was therefore decided to perforate the timber to the desired depth of penetration and allow the oil to enter the wood with the least possible resistance. The question which naturally arose was whether or not this perforating could be done commercially.

The Columbia Creosoting Company of Portland, Oregon, took this matter up, and designed and built a machine for perforating ties. The photograph on page 50 gives some idea of the design of this machine

The machine runs at a speed of approximately 70 feet per minute, and will perforate ties as rapidly as it is possible for la-

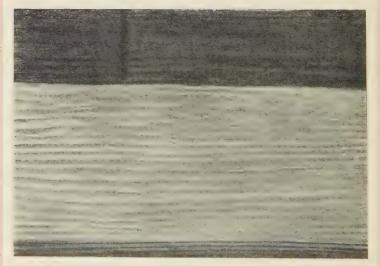


Fig. 6. A piece of Douglas fir which has been perforated on one side only. This shows that by means of perforations the penetration and distribution of creosote oil can be absolutely controlled.

RESULTS OF TESTS IN COMPRESSION PERPENDICULAR TO GRAIN ON DOUGLAS FIR TIE SEC-TIONS-NATURAL, UNPERFORATED-CREOSOTED AND PERFORATED-CREOSOTED

7"x8"x30" AIR-SEASONED MATERIAL

Tests made for the Association of Creosoting Companies of the Pacific Coast.

TABLE 17

	Perforated- Creosoted in Per- Cent of Unperfor- ated-Creosoted. Unperforated- Creosoted= 100 per cent	Per Cent	95.3 94.4.3 92.5 97.8	94.7
Relative Strength of	Perforated-Creosoted in Per Cot of Natural-100 per cent	Per Cent	82.9 122.9 118.2 93.1 124.9	105.2
- H	Unperforated- Croosoted in Per Cent of Natural. Natural= 100 per cent	Per Cent	87.0 130.2 127.2 100.7	0.111
th at In.	Perforated- Creosoted	Lbs.	567 570 513 516 487	531
Compressive Strength at Elastic Limit per Sq. In.	Unperfor- ated- Creosoted	Lbs.	595 604 552 558 498	561
Comp	Natural	Lbs.	684 464 434 554 390	505
	Perforated- Creosoted			
Number of Tests	Unperfor- ated- Creosoted			
Z	Natural			
	Tie	-1004v	Average	

borers to handle them. The vertical rolls perforate the sides, and the horizontal rolls the top and bottom faces. The ties should, of course, be bored for spikes before treatment.

A good spacing for the perforations is shown by Fig. 5. It will be noted that these perforations are so arranged that it is only necessary for the creosote to pass along the grain a distance of $3\frac{1}{2}$ inches from each perforation, in order to give complete penetration on all faces of the tie, to a depth equal to that of the perforations.

Fig. 6 shows the results of creosoting perforated Douglas fir. One side of the specimen shown was perforated and the other side was treated in its natural condition. Note the even distribution of oil in the perforated side and the increased depth of penetration.

The question as to the effect of the perforating upon the strength of the wood came up immediately for consideration. For the purpose of securing reliable data on this point, strength tests were made on ties in both the natural and treated conditions.

Table 17 gives results of tests on three classes of material. namely, air-seasoned, natural, unperforated-creosoted and perforated-creosoted. The creosoted ties were treated by the "Boiling Under Vacuum Process."

The average results of these tests show the creosoted sections to be stronger than the natural.

In order to secure additional data on this subject it was decided to make further tests on ties perforated and treated by this method. The following report on the results of these tests gives reliable data on the effect of this method of perforating upon the strength of Douglas fir ties.

City of Portland Department of Public Works Bureau of Standards

Report of side compression test of creosoted tie sections. Tested for O. P. M. Goss, consulting engineer for the Association of Creosoting Companies of the Pacific Coast.

Purpose. To determine the effect of perforations on the strength of creosoted railroad tie sections in compression perpendicular to the grain.

MATERIAL. The material consisted of Douglas fir, merchantable grade, of the following dimensions:

 $10-10"x4\frac{1}{2}"x5'$.

One-half of each tie was perforated the other half being

unperforated. They were selected so that the two halves of each tie were of as nearly equal quality as it was possible to obtain. Each tie was treated by the "Boiling Under a Vacuum Process." After treatment the 20 sections were brought to Portland, Oregon, and tested by the Bureau. The test was applied to the corresponding side in each pair.

METHOD OF TESTS. The tie sections were tested on a 150,000 pound Universal Riehle Testing Machine. The specimen was placed on the bed of the testing machine and a steel compression plate 8"x12"x1½" was placed crosswise on the specimen. A 10-inch spherical compression tool was placed between the head of the testing machine and the steel compression plate to insure equal distribution of the load. The dimensions of the specimens were taken at the center directly under the compression plate.

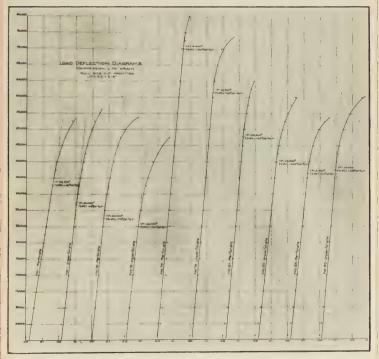
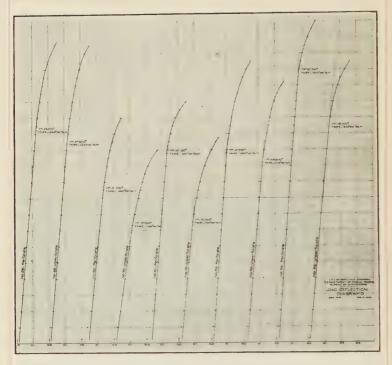


Diagram 10. Load-deflection diagrams for crossoted Douglas fir ties, perforated and unperforated. Tests made in compression perpendicular to grain.



Load-deflection diagrams for creosoted Douglas fir ties, perforated and unperforated. Tests made in compression perpendicular to grain.

being averages of two readings. The area of compression was 8 inches times the width of the specimen. An initial load of 1,000 pounds was applied to each section, after which the deflection reading apparatus, an Olsen Improved Deflectometer reading to 0.001 of an inch, was adjusted to zero reading when the load was applied continuously to well beyond the yield point. The rate of application of the load was 0.046 inch per minute.

RESULTS. The load deflection diagrams* and table* of results are attached.

Date of Tests: Tests made on November 26 and 27, 1915. Observers:

Oscar Beck Approved by

Signed R. G. DIECK

John O. Baker

Signed R. S. Dulin Commissioner of Public Works Chief, Bureau of Standards

*Refers to diagrams 10 and 11 and to table 18.

PACIFIC COAST WOODS

RESULTS OF TESTS IN COMPRESSION PERPENDICULAR TO GRAIN ON CREOSOTED DOUGLAS FIR TIE SECTIONS

10"x4.5"x2'-6"

Tests made by the Bureau of Standards, Portland, Oregon.

TABLE 18

	Rings p	er Inch	Compressive	Compressive Strength at Elastic Limit per Sq. In.						
Tie Number	Unperforated	Perforated	Unperforated	Perforated	Strength of Perforated in Per Cent of Unperforated Unperforated = 100 per cent					
	Cuperiorated	renorated	Lbs.	Lbs.	Per Cent					
1	6	6	419	481	114.8					
78	9	9	350	376	107.5					
79	9	9	765	900	117.6					
82	7	7	545	631	115.8					
83	6	6	523	512	97.9					
88	6	6	616	666	108.1					
90	9 5	9	366	480	131.1					
91	5	5	375	595	158.6					
93	7	7	555	590	106.3					
96	7	7	670	845	126.1					
verage	7.1	7.1	518	608	117.4					

The table of results contained in this report shows the perforated ties to be 117.4 per cent as strong as the unperforated. In only one individual case is the unperforated piece stronger than the corresponding perforated section and in most instances the increase in strength due to perforation is marked. Thorough penetration was secured in all the ties by means of this method of perforation. These results correspond very closely to previous tests on perforated material and prove that by the proper method of perforation it is possible to creosote Douglas fir ties, distributing the oil where wanted and without loss in strength in the wood.

A good method of preparing for the treatment of railroad ties of Douglas fir or western hemlock would be as follows:

Cut ties in winter and early spring. Perforate and openpile for air seasoning, taking advantage of the summer months. The ties may then be treated during the fall and winter. Handling ties in this way will insure an absolute protection against decay, and will enable the wood to be creosoted without loss in mechanical strength. These two points will insure the greatest value possible in the way of service, from this form of material:

SPIKE PULLING TESTS. The relative value of the various species of wood used for ties has been the cause of considerable discussion in the past, particularly with regard to the holding

power of railroad spikes in these woods. With the increasing use of creosoted ties the screw spike is likewise becoming more popular, as the increased length of life of treated ties warrants the use of a more permanent method of rail fastening.

In order to determine the holding force of spikes under various conditions in natural and treated timber, the Seattle Timber Testing Laboratory of the U. S. Forest Service recently made a series of spike pulling tests on natural and creosoted commercial Douglas fir railway ties. Permission to publish the results of these tests has been granted through the courtesy of the Forest Service.

The test material consisted of 18 commercial grade Douglas fir ties, two sections of each tie being used for these tests. Both common and screw spikes were pulled from these sections, one of which was green and the other creosoted. Holes ranging in size from % to % inch were bored in each tie, those in the creosoted ties being bored before treatment.

Table 19 contains the complete results of these tests.

The following points are mentioned in connection with the use of this table:

- (1) The form of the point of the common spike is such that it inclines not to follow the hole.
- (2) Care was exercised in these tests to have the spikes follow the holes.
- (3) If the holes are not too large (three-eights inch or seven-sixteenths inch) and the spikes follow the holes closely the resistance to withdrawal will usually be increased.
- (4) If spikes do not follow the holes the resistance to withdrawal may be greatly reduced.
- (5) Spikes driven close to the holes but not into them will have their resistance lowered.
- (6) The splitting of the tie and the breaking of the fiber is reduced when the spikes are driven into bored holes.

In the tests on the holding power of common spikes the results for the treated and natural material show very little difference. In the natural wood the spikes driven into the "s-inch holes showed the greatest holding power, while in the treated those driven into the 12-inch holes required the greatest force to pull them from the timber. The screw spikes, which were placed in %-inch holes, pulled considerably harder from the creosoted than from the natural ties.

TABLE SHOWING HOLDING FORCE OF COMMON AND SCREW SPIKES IN NATURAL AND TREATED DOUGLAS FIR TIES-GREEN MATERIAL

Data furnished by the Seattle Timber Testing Laboratory of the U. S. Forest Service, TABLE 19

		2 4		,							
	63	Spikes	Mark F	Lbs.	12430 12540 10270 10870 11280 8500 14050 8490 8490 8130 7390 11240 8560 11520 11520 11520 11520 11520 11520 11520 11520 11520	10182 14050 7390					
	to Pull Spike		Mark E	Lbs.	3300 4540 3920 3920 3840 4160 2710 2710 4210 41190 4120 2960 44170 4890 4890	3778 4890 2650					
reated Ties	d to Pu	kes	Mark D	Lbs.	3800 4580 3360 4550 4320 4320 5270 5270 5270 5270 4490 4490 4480 4480 4480	4474 6320 2770					
H	Required	Common Spi	Соттоп	Common	Common		Mark C	Lbs.	44880 33440 4450 4450 33740 33740 33860 4270 4270 4270 4270 4270 4880 4880 4880 4880 4880 4880 4880	4352 6080 3150	
	Force						Com	Mark B 3/8" Hole	Lbs.	4190 33300 33300 33300 44400 44430 53360 53360 44990 44990 44350 4350 4350 4350 4350	4298 5490 2870
							Mark A No Hole	Lbs.	33510 325040 44920 44920 44920 44920 4500 4500 4600	4160 5050 2990	
			Moisture	Per Cent	26.0 23.23.88 25.7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	25.7 32.1 23.6					
		Spikes Spikes	Mark F %" Hole	Lbs.	7450 8670 8670 8670 9090 9290 9560 11220 7040 8380 8100 9420 7360 9330 8320 8320 8320 8320 8320	8967 11220 7040					
	Natural Ties e Required to Pull Spike Common Spikes		Mark E	Lbs.	3100 3100 3100 3650 3650 3650 3100 33100 3320 3320 3450 4520 3340 4530 4530 4530	3646 4920 2750					
ral Ties		pikes	pikes	Mark D	Lbs.	3740 35120 3570 3570 4120 4120 5090 5090 5090 5090 5090 5090 5090 50	4115 5480 2860				
Natu		amon S	Mark C	Lbs.	3760 55010 55010 5250 4150 3960 4500 3940 3940 5450 5450 5450 5450 5450 5450 5450 5	4507 5460 2910					
	Force R		Mark B %" Hole	Lbs.	4910 4520 4540 4540 4790 4790 4720 4720 4030 4030 4030 4720 5820 4870	4627 5990 3470					
	Mark A Mo Hole				4470 5020 5020 5020 6530 4530 4630 8500 4440 8510 4770 4770 4770 4610 5070 6020	4555 6020 3000					
	Moisture Content Per Cent			Per Cent	88888888888888888888888888888888888888	33.3 39.2 31.2					
	Summer- wood Per Cent				2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	30 18 18					
~~			Rings per Inch		10.0 10.0	13.6 50.0 4.0					
Specific Gravity Ovendry Based on Green Volume					0.428 0.461 0.461 0.461 0.531 0.531 0.437 0.482 0.465 0.465 0.465 0.465 0.465 0.465	0.451 0.531 0.370					
	Reference Number				1.0%4m@f.%&&Ö1.3%47%57%	Average Maximum					

The results of these tests together with those on the perforation of Douglas fir show marked progress in the preservation and utilization of creosoted Douglas fir railway ties and should encourage the use of this wood for tie purposes, to which it is unusually well adapted.

FORMULAE FOR RECTANGULAR BEAMS

The symbols below are used in all the following formulae:

l =Length of span, in inches.

b = Width of beam, in inches. (In mill and laminated floor computations, b = 12 inches.)

h = Height of beam, in inches.

V = Maximum vertical shear, in pounds.

J = Maximum unit horizontal shear, in pounds per square inch.

J' = Allowable unit horizontal shear (any safe value), in pounds per square inch.

I = Moment of inertia of cross section of beam about neutral

axis, in inches4.

A = Area of cross section of beam, in square inches.

S = Section modulus, in inches³.

n = Distance from neutral axis to extreme fiber in inches. For a rectangular beam this equals one-half the height of beam.

f = Safe unit stress, extreme fiber, in pounds per square inch.

E = Modulus of elasticity, in pounds per square inch.

d = Maximum deflection, in inches.

D = Deflection equivalent to $\frac{1}{32}$ inch per foot of span.

w = Load on beam per foot of span, in pounds.

W = Total load on beam $\left(\frac{\mathbf{w}\ l}{12}\right)$, in pounds.

M = Maximum external bending moment; also the internal resisting moment of the beam cross section; in inch pounds.

L' = Total floor load per square foot, in pounds. Equals live load per square foot plus weight of floor per square foot. Used in computing maximum span tables for mill and laminated floors.

$$I = \frac{bh^3}{12} \qquad S = \frac{I}{n} = \frac{bh^2}{6} \qquad M = fS$$

MAXIMUM UNIT HORIZONTAL SHEAR IN RECTANGULAR BEAMS

When a beam is loaded the horizontal shear which is developed produces a tendency to split along the neutral axis*. The formula for maximum unit horizontal shear in a rectangular beam is:

 $J = 1.5 \left(\frac{V}{bh}\right)$

^{*} The neutral axis of a rectangular beam is in a plane separating the upper and lower halves when the beam is horizontal.

When a rectangular beam is symmetrically loaded the maximum vertical shear, V, is $\left(\frac{W}{2}\right)$ and therefore the maximum unit horizontal shear is:

$$J = 0.75 \left(\frac{W}{bh} \right)$$

From this formula it is seen that the maximum unit horizontal shear varies directly with the load. For a given fiber stress "f" (say 1,000 lbs. per sq. in.), developed in a beam, the safe load. W. for center loading is one-half that for uniform loading, and for third-point loading it is three-fourths of that for uniform loading. Therefore, the maximum unit horizontal shear for center loading is one-half of the horizontal shear for uniform loading and for third-point loading it is three-fourths of that for uniform loading.

SAFE LOADS LIMITED BY HORIZONTAL SHEAR

The safe load, W, in pounds, on a beam, limited by any given safe unit horizontal shearing stress, J', pounds per square inch, may be found by the formula:

$$W = \frac{J'bh}{0.75}$$

SAFE LOADS ON BEAMS (CONSIDERING BENDING ONLY)
CENTER LOADING:

$$\begin{split} \frac{\mathrm{fI}}{\mathrm{n}} &= \mathrm{M} = \left(\frac{\mathrm{W}}{2}\right) \left(\frac{l}{2}\right) = \frac{\mathrm{W}l}{4} \\ \mathrm{W} &= \frac{4\mathrm{fI}}{l\mathrm{n}} = \frac{4\mathrm{f}}{l} \left(\frac{\mathrm{bh}^2}{6}\right) = 2/3 \left(\frac{\mathrm{fbh}^2}{l}\right) \end{split}$$

THIRD POINT LOADING:

$$\begin{aligned} &\frac{fI}{n} = M = \left(\frac{W}{2}\right) \left(\frac{l}{3}\right) = \frac{Wl}{6} \\ &W = \frac{6fI}{ln} = \frac{6f}{l} \left(\frac{bh^2}{6}\right) = \left(\frac{fbh^2}{l}\right) \end{aligned}$$

UNIFORM LOADING:

$$\begin{split} &\frac{\mathrm{fI}}{\mathrm{n}} = \mathrm{M} = \left(\frac{\mathrm{W}}{2}\right) \left(\frac{l}{2}\right) - \left(\frac{\mathrm{W}}{2}\right) \left(\frac{l}{4}\right) = \frac{\mathrm{W}l}{8} \\ &\mathrm{W} = \frac{8\mathrm{fI}}{l\mathrm{n}} = \frac{8\mathrm{f}}{l} \left(\frac{\mathrm{bh}^2}{6}\right) = \frac{4}{3} \left(\frac{\mathrm{fbh}^2}{l}\right) \end{split}$$

MAXIMUM DEFLECTION IN BEAMS

The following formulae apply only within the elastic limit of the beam:

CENTER LOADING:

$$\mathrm{d} = \left(\frac{1}{48}\right) \, \left(\frac{\mathrm{W}l^3}{\mathrm{EI}}\right) = \left(\frac{1}{48}\right) \, \left(\frac{\mathrm{W}l^3}{\mathrm{Ebh^3}}\right) = \frac{1}{4} \, \left(\frac{\mathrm{W}l^3}{\mathrm{Ebh^3}}\right)$$

THIRD POINT LOADING:

$$d = \begin{pmatrix} \frac{23}{1296} \end{pmatrix} \begin{pmatrix} \frac{Wl^3}{EI} \end{pmatrix} = \begin{pmatrix} \frac{23}{1296} \end{pmatrix} \begin{pmatrix} \frac{Wl^3[12]}{Ebh^3} \end{pmatrix} = \begin{pmatrix} \frac{23}{108} \end{pmatrix} \begin{pmatrix} \frac{Wl^3}{Ebh^3} \end{pmatrix}$$

UNIFORM LOADING

$$\mathrm{d} = \left(\frac{5}{384}\right) \, \left(\frac{\mathrm{W} l^3}{\mathrm{EI}}\right) = \left(\frac{5}{384}\right) \, \left(\frac{\mathrm{W} l^3 [12]}{\mathrm{Ebh^3}}\right) = \left(\frac{5}{32}\right) \, \left(\frac{\mathrm{W} l^3}{\mathrm{Ebh^3}}\right)$$

MAXIMUM SPAN—MILL AND LAMINATED FLOORS CENTER LOADING:

$$\frac{f I}{n} = \frac{Wl}{4} \therefore l = \frac{4f}{W} \left(\frac{I}{n}\right) = \frac{\frac{4f}{lL'}}{12} \left(\frac{bh^2}{6}\right)$$
$$l^2 = \frac{8fbh^2}{L'} \therefore l = \checkmark \frac{8fbh^2}{L'}$$

THIRD POINT LOADING:

$$\begin{split} \frac{\mathrm{f}\,\mathrm{I}}{\mathrm{n}} &= \frac{\mathrm{W}\,l}{6} \,\therefore \,\, l \,= \frac{\mathrm{6f}}{\mathrm{W}}\!\!\left(\frac{\mathrm{I}}{\mathrm{n}}\right) \,= \frac{\frac{\mathrm{6f}}{l\mathrm{L}'}}{\frac{\mathrm{I}2}{\mathrm{m}}} \left(\frac{\mathrm{b}\mathrm{h}^2}{\mathrm{6}}\right) \\ l^2 &= \frac{12\mathrm{f}\,\mathrm{b}\mathrm{h}^2}{\mathrm{L}'} \,\,\therefore \,\, l \,= \,\, \swarrow \,\, \frac{12\mathrm{f}\,\mathrm{b}\mathrm{h}^2}{\mathrm{L}'} \end{split}$$

UNIFORM LOADING:

$$\frac{f I}{n} = \frac{W l}{8} \therefore W = \frac{8f I}{ln}$$

$$l = \frac{8f}{W} \left(\frac{I}{n}\right) = \frac{8f}{W} \left(\frac{bh^2}{6}\right) = \frac{4}{3} \frac{fbh^2}{W}$$

$$W = \frac{l}{12} L'$$

$$\therefore l = \frac{4}{3} \left(\frac{fbh^2}{l_2 L'}\right) = \frac{16fbh^2}{lL'}$$

$$l^2 = \frac{16fbh^2}{L'} \therefore l = \sqrt{\frac{16fbh^2}{lfbh^2}}$$

DEFLECTIONS IN MILL AND LAMINATED FLOORS

CENTER LOADING:

$$\begin{aligned} \mathbf{d} &= \begin{pmatrix} \frac{1}{48} \end{pmatrix} \begin{pmatrix} \frac{\mathbf{W} l^3}{\mathbf{E} \mathbf{I}} \end{pmatrix} & \mathbf{W} &= \frac{l}{12} \mathbf{L}' \\ \mathbf{d} &= \begin{pmatrix} \frac{1}{48} \end{pmatrix} \begin{pmatrix} \frac{l}{12} \mathbf{L}' \ \frac{l^3}{\mathbf{E} \mathbf{b} \mathbf{h}^3} \end{pmatrix} &= \frac{1}{(48) \ (1,643,000)} \begin{pmatrix} \frac{\mathbf{L}' \ l^4}{\mathbf{b} \mathbf{h}^3} \end{pmatrix} \\ \mathbf{d} &= 0.000,000,012,68 \begin{pmatrix} \frac{\mathbf{L}' \ l^4}{\mathbf{b} \mathbf{h}^3} \end{pmatrix} \end{aligned}$$

THIRD POINT LOADING:

$$d = \left(\frac{23}{1296}\right) \left(\frac{Wl^3}{EI}\right) \qquad W = \frac{l}{12} L'$$

$$d = \left(\frac{23}{1296}\right) \left(\frac{\frac{l}{12} L'l^3}{\frac{Ebh^3}{12}}\right) = \frac{23}{(1296)(1,643,000)} \left(\frac{L'l^4}{bh^3}\right)$$

$$d = 0.000,000,010,8 \left(\frac{L'l^4}{bh^3}\right)$$

UNIFORM LOADING:

$$d = \left(\frac{5}{384}\right) \left(\frac{Wl^3}{EI}\right) \qquad W = \frac{l}{12} \quad L'$$

$$d = \left(\frac{5}{384}\right) \left(\frac{\frac{l}{12} L' l^3}{\frac{Ebh^3}{12}}\right) = \frac{5}{(384) (1,643,000)} \left(\frac{L' l^4}{bh^3}\right)$$

$$d = 0.000,000,007,92 \left(\frac{L' l^4}{bh^3}\right)$$

BENDING MOMENT AND SHEAR

The following bending moment and shear diagrams are shown for cantilever beams and for free end beams supported at the two ends. Various methods of loading are shown for each type of beam. The bending moment and shear diagrams are shown above and below the beams, respectively.

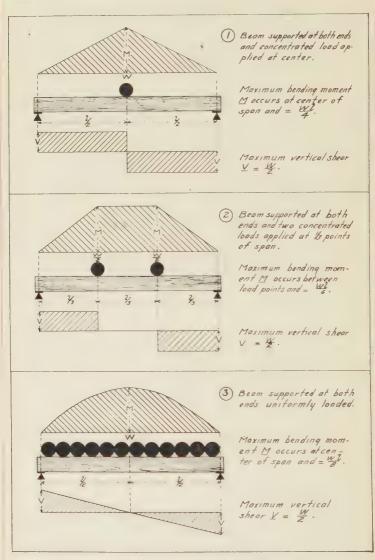
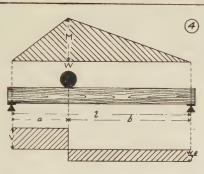


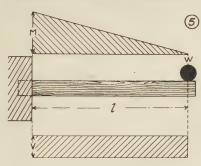
Diagram 12. Bending moment and shear diagrams.



Beam supported at both ends and unsymmetrical concentrated load applied.

Maximum bending moment M occurs at point of load and = $ax\frac{wo}{7}$.

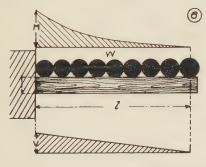
Maximum, vertical shear = Wx .



Cantilever beam with concentrated load applied at free end.

Maximum bending moment M occurs at fixed end and = W?.

Maximum vertical shear V=W.

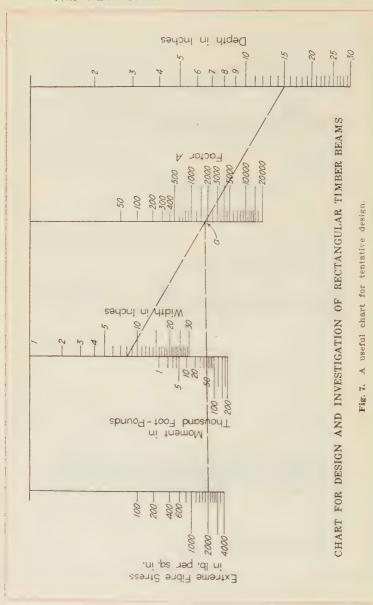


Contilever beam uniformly loaded .

Maximum bending moment M occurs at fixed end and $=\frac{WL}{2}$.

Maximum vertical shear V = W.

Diagram 13. Bending moment and shear diagrams.



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PACIFIC COAST WOODS

Figure 7 is a chart taken from Engineering Record of June 26, 1915, and makes possible, rapid calculations for rectangular timber beams. Assume a working stress of 2000 pounds/sq. in. and it is desired to find a beam of sufficient size to resist a bending moment of 50,000 foot pounds. Place a straight edge on 2000 on the "Extreme Fiber Stress" scale and allow it to pass through 50 on the scale "Moment in Thousand Foot-pounds" and project to an intersection on the "Factor A" scale. Place the straight edge on this intersection point on "Factor A" scale as a pivot and read the width of beam required on the "Width in Inches" scale and the corresponding height of beam on the "Depth in Inches" scale. Any number of combinations of sizes may be selected which will fulfill the conditions assumed. The above operation may be reversed if the designer wishes to start with a definite size timber.

SAFE TOTAL LOADS AND OTHER PROPERTIES OF BEAMS

In the preparation of table 20 on beams, an effort has been made to tabulate information which will enable the designer to effect his design with minimum effort and maximum efficiency. The figures in the tables are based on beams of actual sizes surfaced S1S1E or S4S. A multiplying factor has also been computed which may be used to transfer rapidly the various loads, deflections, and other properties to the corresponding values for rough beams of full sizes as shown. These factors are written in bold face type for each size timber, and apply to figures in the same vertical column written. In this table, the area of cross section, the moment of inertia of the cross section, the section modulus, the span and the ratio of span to depth of beam are given, all for actual sizes of surfaced timbers. The safe loads and corresponding maximum deflections for uniformly distributed loads are also given, covering a range of safe fiber stresses varying from 1,000 to 2,000 pounds per square inch. The safe load, as shown, is the superimposed load, the weight of the beam having been deducted. The deflection given is that produced by the safe load shown plus the weight of the beam. The deflections are computed for beams of Douglas fir using a modulus of elasticity of 1,643,000 pounds per square inch. This value for the modulus of elasticity was determined by a careful consideration of all available data on the stiffness of Douglas fir as shown by the following tests:

Reference—	No. of	Average
Grade	Tests	M. of E.
U. S. Forest Service Bulletin 108, table 8 Grade I	81	1,643,000
U. S. Forest Service Bulletin 108, table 14 All Grades	134	1,611,000
U. S. Forest Service Bulletin 88, table 8 Select	59	1,654,000
City of Portland, Oregon, Bureau of Standards Merch.	16	1,713,000
Am. Ry. Eng. Assn. Bulletin 184, table 4 Santa Fe Star	nd. 52	1,701,900

Total 342 Av. 1.645,000

The above values include a large number of tests that are of an average grade below that used in general construction work and below that proposed by the West Coast Lumbermen's Association on pages 31 and 33. The only values falling below that used in this book are for those tests in which timbers of all grades were included. The remaining tests, representing average grades, show the figure for the modulus of elasticity of 1,643,000 herein used to be conservative. There is also shown in table 20 the number of pounds supported by the actual sized beam per board foot of rough lumber. This may be termed "Efficiency Factor." This factor should be useful in determining an economical design. The higher the factor the greater is the efficiency of the beam.

In this table no loads are given which produce maximum horizontal shearing stresses of more than 185 pounds per square inch, which unitl stresses are justified as shown by the tests given on pages 18 and 19. The maximum unit horizontal shearing stresses actually produced by those loads supported on the shorter spans are given for each size beam. The values for longer spans will be lower.

The column "D," farthest to the right, shows deflections equivalent to $\frac{1}{3^{12}}$ of an inch per foot of span.

Deflections are proportional to loads, therefore, the ratio ${\color{blue}{\rm Load}}$) is constant for a given beam section and span. To

(Deflection) find the load (W') corresponding to any deflection, (d'), within the elastic limit and which is not shown in the tables, divide the "given load (W) plus weight of beam" by "given deflection (d)," and multiply the result by the particular deflection in question (d'), and subtract the weight of beam.

$$(W + weight of beam) = \frac{(W' + weight of beam)}{d'} = Constant$$
 therefore $W' = \left[\frac{(W + weight of beam)}{d}\right] d' - (weight of beam).$ Usually in practice the weight of the beam in the above computation may be neglected, which will simplify the operation to dividing the given load by the given deflection and multiplying the result by the particular deflection to secure the new load.

For safe loads on beams in which a concentrated load is applied at the center of the span, multiply the load given in the table by 0.50. For safe loads on beams in which equal concentrated loads are applied at the third points of the span, multiply the given load by 0.75.

For deflections in beams in which a concentrated load equal to one-half that shown in the table is applied at the center of the span, multiply the deflection given in the table by 0.802. For deflections in beams in which equal concentrated loads totaling three-fourths that shown in the table, are applied at the third points of the span, multiply the given deflection by 1.025.

SUPPORTED AT BOTH SAFE LOADS AND DEFLECTIONS FOR DOUGLAS FIR BEAMS ENDS AND UNIFORMLY LOADED TABLE

To get values for rough sizes multiply factor by number in bold face type in same vertical column for any given size, Values in this table are based on surfaced sizes.

Shearing Stress developed. Maximum Horizontal Shear allowed, 185 Pounds per Square Inch. Modulus of Elasticity used, 1,643,000 Pounds per Square Inch. Ref. No. 3.—Pounds supported per Board Foot, Ref. No. 4.—Maximum Horizontal Shearing St Ref. No. 1.—Total Safe Superimposed Load, Pounds. Ref. No. 2.—Maximum Deflection, Inches.

For full explanation of this table see pages 68 to 70.

Deflection equivalent to 1/32	Foot of Span	Q	In.	0.0938	0.125	0.156	0.188			
		0000	2000		1182 0.161 443 151	942 0.252 283	783 0.363 196			
flections		1000	1900	1421 0.0817 711 182	1063 0.145 399	847 0.227 254	704 0.327 176			
Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Sonare Inch. as indicated		1800	non	1262 0.0726 631 161	944 0.129 354	752 0.202 226	625 0.290 156			
Maxim s in Pou		1800	0001	1183 0.0681 592 151	885 0.121 332	705 0.189 212	585 0.272 146			
Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Sonare Inch. as indicated		1400	00*1	1104 0.0636 552 141	826 0 113 310	0.176 197	545 0.254 136			
n Pound or Unit		1900	1900	1025 0.0590 513 131	766 0 105 287	0.164 0.164 183	506 0.236 127			
Loads in		1900	1200	945 0.0545 473 121	0.0969	562 0.151 169	466 0.218 117			
l Safe		1100	1100	866 0.0499 433 111	0 0888 0. 243	515 0.139 155	0.200 107			
Tota	Reference Number			0.0454 0.0 394 101	588 0 0808 220	467 0.126 140	387 0.182 97			
				-004		-0700	-000			
Ratio of Span to	Span Reference of Num Surfaced ber Timber			6.6	13.2	16.6	19.9			
5	TRÃO.		Fr.	8	₩	ro	9			
Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		1.554	1.359				
Section Modu- lus	S 6		In.3		3.56	1.498				
Moment of Inertia				I=12		In.4		6.45	1.654	
Area Cross Section	Surfaced S1S1E		Sq. In.		5.89	328				
ize			In.		00 00 00 00 00 00 00 00 00 00 00 00 00					
α·	Size Surf Surf Surf				2x4					

										_	
0.219		0.125	0.156	0.188	0.219	0.250	0.281	0.313	0.344		
667 0.494 143	1.50 0.91 1.10			1892 0.234 315 156	1615 0.318 231	1409 0.416 176	1248 0.526 139	0.650 0.650 112	1011 0.785 92	1.40	
589 0.444 128	1.50 0.91 1.10		2045 0.146 409 169	0.211	1452 0.287 207	1266 0.374 158	0.474 1125 125	1004 0.585 100	907 0.707 82	1.40 0.94 1.07	
0.395 114	1.50		1817 0.130 363 150	1511 0.187 252	1289 0.255 184	0.333 140	994 0.421 110	890 0.520 89	803 0.628 73	1.40 0.94 1.07	
0.370 107	1.50	2134 0.0780 534 176	1703 0.122 341	1416 0.176 236	1207 0.239 172	1052 0.312 132	931 0.395 103	833 0.487 83	0.589 68 68	1.40 0.94 1.07	
464 0.346 99	1.50	1991 0.0728 498 164	1588 0.114 318	1320 0.164 220	1125 0.223 161	981 0.291 123	867 0.368 96	775 0.455 78	0.550 0.550	1.40 0.94 1.07	
430 0.321 92	1.50	1848 0.0676 462 152	1474 0.106 295	1225 0.152 204	1044 0.207 149	909 0.270 114	804 0 342 89	718 0.422 72	648 0.511 59	1.40	
396 0.296 85	1.50	1705 0.0624 426 140	0.0974 272	1130 0.140 188	962 0.191 137	838 0.250 105	740 0.316 82	0.390 0.66	596 0.471 54	1.40 0.94 1.07	
362 0.272 78	1.50	1562 0.0572 391 129	0.0893 249	1034 0.129 172	881 0.175 126	766 0.229 96	677 0.289 75	604 0.357 60	544 0.432 49	1.40 0.94 1.07	1
328 0.247 70	1.50	0.0520 355 117	0.0812 226	939 0.1170 157	799 0.159 114	695 0.208 87	613 0.263 68	547 0.325 55	492 0.393 45	1.40 0.94 1.07	;
-010	124	- c1 to 4	H02004	H 21 82 4	122	10200	-0.00			124	
23.2	Multiplying	20.	10.7	12.8	14.9	17.1	19.2	21.3	23.5	Multiplying Factor	200
	Mult	→	10	9	L~	00	6	10	Ξ	Mult	,
					2.411	1.313					
					8.57	1.400					
	,				24.10	1.494					
	1				9.14	1.313					
	1				1000 X 0000 1000						
					2x6						

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflection equivalent	Inch per Foot of Span	A	In.	0.156	0.188	0.219	0.250	0.281	0.313
ages 6			0000				2877 0.238 308 178	2512 0.311 236	2227 0 394 186	1998 0.486 150
e see p	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stressee in Pounds per		1800				2587 0.215 277 161	2258 0.280 212	2001 0.355 167	1795 0.438 135
is tab	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per		1600			2688 0.140 336 167	2297 0.191 246	2004 0.249 188	1776 0.316 148	1592 0.389 119
n of th	Maxim s in Pou	leated	1500			2519 0.131 315 156	2152 0.179 231	1878 0.234 176	1663 0.296 139	1491 0.365 112
lanatic	ds, and Stresse	ı, as ınd	1400		2826 0.0852 424 175	2350	2007 0.167 215	1751 0.218 164	1550 0.276 129	1389 0.340 104
ıll exp	n Poun or Unit	Square Inch, as indicated	1300		2623 0.0791 393 162	2181 0.114 273	1862 0.155 200	$\frac{1624}{0.202}$	1437 0.256 120	1288 0.316 97
For fr	Loads i	in the state of th	1900		2420 0.0730 0. 363 150	2011 0.105 251	0.143 184	1497 0.187 140	.1325 0.237 110	1186 0 292 89
	l Safe		1100		2217 0.0669 332 137	1842 0.0963 230	0,131 168	1370 0.171 128	1212 0.217 101	1085 0.267 81
	Tots		1000	2004	2014 0.0608 302 125	0.0876 0.0	1427 0.119 153	1243 0.156 117	1099 0.197 92	9x3 0 243 74
	Refer-	Num- ber			-0004	-0004	-004	-000	700	322
	Ratio of Span to	Depth of Surfaced Timber	1/Ъ		8.0	9.6	11.2	12.8	14.4	16 0
		Span		H T	70	9	~	00	6	55 .
	Weight Per Lineal Foot (Based	on Green Timber	lbs. per cu. ft.)	Lbs.			3 216			-
	Section Modu- lus	bh²	9	In.3			15.23			
inued.	Moment of Inertia	bh³	12	In.4			57.13			
20—Continued.	Area Cross Section	P P		Sq. In.			12.19			
LE 20-	.vize	Surfaced S1S1E	or SAS	In.			15x72			
TABLE	<i>y</i> .	Rough	TO COLOR	In.			2x8			

										H A. NO.
0.344	0.375	0.406	0.438	0.469		0.219	0.250	0.281	0.313	
1811 0.589 123	1653 0.701 103	1520 0.822 88	1405 0.954 75		1.40			3585 0.312 239 176	3219 0.385 193	
1626 0.530 111	1484 0.631 93	1364 0.740 79	1260 0.858 68	0.986	1.40 0.94 1.06		3635 0.222 273 178	3223 0.281 215	2893 0.346 174	
1442 0.471 98	1315 0.561 82	1208 0.658 70	1115 0.763 60	1035 0.876 52	1.40	3697 0.151 317 181	3228 0.197 242	2861 0.249 191	2567 0.308 154	
1350 0 442 92	1230 0.526 77	1130 0.617 65	1043 0.716 56	968 0.822 48	1.40	3465 0.141 297 170	3024 0.185 227	2680 0.234 179	2404 0.289 144	
1257 0.412 86	1145 0.490 72	1051 0.576 61	970 0.668 52	900	1.40 0.94 1.06	3232 0 132 277 159	2820 0.172 212	2498 0.218 167	2241 0.269 134	
0.383 79	1061 0.455 66	973 0.534 56	898 0.620 48	832 0.712 42	1.40	2999 0.123 257 147	2616 0.160 196	2317 0.203 154	2078 0.250 125	
1073 0.353 73	976 0.420 61	895 0.493 52	825 0.572 44	764 0.657 38	1.40 0.94 1.06	2766 0.113 237 136	2413 0.148 181	2136 0.187 142	1915 0.231 115	(e.)
980 0.324 67	892 0.385 56	817 0.452 47	753 0.525 40	697 0.602 35	1 40 0.94 1.06	2533 0.104 217 125	2209 0 135 166	1955 0.171 130	1752 0.212 105	Next Page.)
888 0.294 61	807 0.350 50	739 0.411 43	0.477	0.548 31	1.40	2300 0.0942 197 113	2005 0.123 150	1774 0.156 118	1589 0.192 95	on Ne
H 01 00	-0.00		~0700	22.52	124	H02004	1101014	1004	325	Continued on
17.6	19.2	20.8	22.4	24.0	Multiplying Factor	& &	10.1	11.4	12.6	20
11	12	13	1	15	Multi	7	o _o	6	10	(Table
		3.216			,		4.073	267		
		15.23	1.400				24.44			
		57.13	1.494				116.10	3		
		12.19	1.313				15.44			
		15x71					15x91			
		2x8					2x10			

7:

s to 70.	Deflection tion equivalent alent to 1/32	Inch per Foot of Span	Q	In.	0.344	0.375	0.406	0.438	0.469	0.500	0.531
ages 68		<u> </u>	0006	0007	2919 0.465 159	2669 0.554 133	2455 0.650 113	2271 0.754 97	2113 0.866 85	1973 0.985 74	
For full explanation of this table see pages 68 to 70	Total Safe Loads in Pounds, and Maximum Deffections in luches, for Unit Stresses in Pounds per		1800	0007	2623 0.419 143	2397 0.499 120	2204 0.585 102	2038 0.678 87	1896 0.779 76	1769 0.886 66	
is tabl	um Dei inds per	ri	1800	2007	2326 0.372 127	2125 0.443 106	1953 0.520 90	0.603	1678 0.693 67	1565 0.788 59	1465 0.890 52
n of th	Maxim s in Pou	indicate	1500	1000	2178 0.349 · 119	1990 0.415 100	1828 0.487 84	1689	1570 0.649 63	1464 0.738 55	1370 0.834 48
lanatio	Loads in Pounds, and Maximum De luches, for Unit Stresses in Pounds per	Square Inch, as indicated	1400	1400	2030 0 326 111	1854 0.388 93	1703 0.455 79	1573 0.528 67	1461 0.606 58	1362 0.689 .51	1274 0.778 45
ull exp	n Poun for Unit	quare L	1200	1900	1882 0 302 103	1718 0.360 86	1577 0.422 73	1456 0.490 62	1352 0.563 54	1260 0.640 47	0.723 42
For fi	Loads i	20	1900	1500	1733 0.279 95	1582 0.332 79	1452 0.390 67	1340 0.452 57	0.519 0.519	0.591	1082 0.667 38
	al Safe		1100	2011	1585 0.256 86	1446 0.305 72	1326 0.357 61	1223 0.415 52	1135 0.476 45	1056 0.542 40	986
	Tota		1000	0001	1437 0 233 78	1310 0.277 65	1201 0 325 55	0.377 47	1026 0.433 41	954 0.492 36	890 0.556
	Refer-	,				1200	1200	- 67 60	-0100	-0160	- c3 co
	Ratio of Span to	Depth of Surfaced Timber	q/2		13 9	15.2	16.4	17.7	19.0	20.2	21.5
		Span		Ft.	11	12	13	#	10	16	17
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			4.073	1.295			
	Section Modu- lus	S bh2	9	In.3			24.44	1.364			
nued.	Moment of Inertia	bh3	12	In.4			116.10	1,435			
-Continued	Area Cross Section	A==bh		Sq. In.			15.44	1.295			
LE 20-	Size	Surfaced	or S4S	In.			18x91		_		6
TABLE	32	Rough		In.			2x10				

0,563	0.594		0.250	0.281	0,313	0.344	0.375	0.406	0.438
	: : :	1.36 0.95 1.05				4288 0.384 195 174	3923 0.458 164	3610 0.537 139	3343 0.623 119
		1.36 0.95 1.05			4251 0.286 213 173	3854 0.346 175	3525 0.412 147	3243 0.483 125	3002 0.561 107
1377 0.997 46		1.36		4202 0.206 233 170	3773 0.254 189	3420 0.307 155	3127 0.366 130	2875 0.430 111	2661 0.498 95
1286 0.935 43		1.36	4440 0.153 278 180	3937 0,193 219	3535 0.238 177	3203 0.288 146	2928 0.343 122	2692 0.403 104	2490 0.467 89
1195 0.873 40	1124 0.972 36	1.36 0.95 1.05	4141 0.142 259 168	3672 0.180 204	3296 0.222 165	2985 0,269 136	2728 0.320 114	2508 0.376 96	2319 0.436 83
1105 0.810 37	1038 0,902 33	1.36 0.95 1.05	3843 0.132 240 156	3406 0.167 189	3057 0.207 153	2768 0.250 126	2529 0.297 105	2324 0.349 89	2149 0.405 77
1014 0.748 34	953 0.833 30	1.36	3544 0.122 222 144	3141 0.155 175	2818 0.191 141	2551 0.231 116	2330 0.275 97	2140 0.322 82	1978 0.374 71
924 0.686 31	867 0.764 27	1.36 0.95 1.05	3246 0.112 203 132	2875 0.142 160	2579 0.175 129	2334 0.211 106	2131 0.252 89	1957 0.295 75	1808 0.343 65
833 0.623 28	781 0.694 25	1.36 0.95 1.05	2947 0.102 184 120	2610 0.129 145	2340 0.159 117	2117 0.192 96	1932 0.229 81	1773 0.268 68	1637 0.312 58
357	-010	~ c3 44	- 01 to 41	-004	c1 c0 4r	01 to 4	H 67 60	-0100	1000
22.7	24.0	Multiplying Factor	∞	9.4	10.4	11.5	12.5	13.6	14.6
18	19	Mult	oc .	6	10	Ξ	12	13	14
		-	1		4.931	1.285			
					35.82	1.340	Virginia V		
					205.95	1.398	_		
					18.69	1.285			
					18X113				
-					2x12				

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	Q	In.	0.469	0.500	0.531	0.563	0.594	0.625	0.656
ages ('n.		0000	0002	3112 0.715 104	2907 0.813	2726 0.918 80				
e see I	fections		1000	non	2793 0.643 93	2608 0.732 82	2445 0.826 72	2300 0.927 64			
is tab]	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per	_	1000	1000	2475 0.572 83	2310 0.650 72	2164 0.734 64	2034 0.824 57	1917 0.917 50		
n of th	Maxim s in Pou	ndicated	002	0001	2316 0.536 77	2161 0.610 68	2024 0.688 60	1902 0.773 53	1792 0.860 47	1692 0.953 42	
lanatic	ils, and Stresses	ch, as i	1400	7400	2156 0.500 72	2011 0.569 63	1883 0.643 55	1769 0.721 49	1666 0.802 44	1573 0.889 39	1488 0.931 35
ıll exp	Loads in Pounds, and Maximum Inches, for Unit Stresses in Pounds	Square Inch, as indicated	1900	00001	1997 0.465 67	1862 0.528 58	1743 0.597 51	1636 0.670 45	1540 0.745 41	1453 0.826 36	1374 0 911 33
For ft	Loads in	<u> 20</u>	1000	1200	1838 0.429 61	1713 0.488 54	1602 0 551 47	1503 0.618 42	1414 0.688 37	1334 0 762 33	1260 0 841 30
	l Safe]		1100	0011	1678 0.393 56	1563 0.447 49	1462 0.505 43	1371 0 566 38	0.631	1214 0.699 30	0 771 27
	Tota		1000	1000	1519 0.358 51	1414 0.407 44	1321 0.459 39	1238 0.515 . 34	1163 0.573 31	$^{1095}_{0.635}$	1033 0 701 25
	Doğum	Num-			-0160	~~	- 27 52		₩ 61 60	322	35
	Ratio of Span	Depth of Surfaced Timber	ч/1		15.7	16.7	17.7	8.8	2 6 E	20 9	21 9
		Span		FF.	155	16	17	25	10	20	21
	Weight per Lineal Foot	On Green Timber at 38	lbs. per cu. ft.)	Lbs.				1.285			
	Section Modu- lus	shd S	9	In.3				35.82		_	
nued.	Moment of Inertia	bh3	12	In.4		_	v · m.	205.95			
20-Continued	Area Cross Section	A=bb		Sq. In.				18.69		V0111	
	Size	Surfaced	or S4S	In.				15x1112			
TABLE	is	Rough		In.				2x12	-		

0.688	0.719		0.281	0.313	0.344	0.375	0.406	0,438
		1.34 0.95 1.04					4987 0.457 164 173	4619 0.530 141
		1.34 0.95 1.04			5320 0.295 207 184	4864 0.350 174	4481 0.412 148	4149 0.477 127
		1 34 0 95 1 04		5206 0.216 223 180	4722 0.262 184	4316 0.311 154	3975 0.366 131	3679 0.424 113
		1.34		4877 0.203 209 169	4423 0.245 172	4042 0.292 144	3722 0.343 123	3444 0.397 105
		1.34 0.95 1.04	5066 0.153 241 175	4548 0.189 195	4123 0.229 161	3767 0.273 135	3468 0.320 114	3209 0.371 98
1304 1.000 30		1 34 0 95 1.04	4701 0.142 224 163	4219 0.176 181	3824 0.213 149	3493 0.253 125	3215 0.297 106	2974 0.344 91
1195 0.923 27		1.34 0 95 1.04	4335 0.131 206 150	3890 0.162 167	3525 0.196 137	3219 0.234 115	2962 0.274 98	2739 0.318 84
1087 0.846 25	1030 0.925 22	1.34 0.95 1.04	3970 0, 121 189 138	3561 0.149 153	3226 0.180 126	2945 0.214 105	2709 0.251 89	2504 0.292 77
978 0.769 22	926 0.841 20	1.34 0.95 1.04	3604 0.110 172 125	3232 0.135 139	2927 0.164 114	2671 0.195 95	2456 0.228 81	2269 0.265 69
	-0133	- 27 4	1004	-004	₩ 07004	357	1084	₩ 62 €2
23.0	24.0	Multiplying Factor	8.0	8.8	8.6	10.7	11.6	12.4
22	23	Mult	6	10	=	12	13	14
					5.788	1.276		
			!		49.36	1.324		
				-	333.18	1.372		
					21.94	1.276		
					18x131			
-					2x14			

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	Q	In.	0.469	0.500	0,531	0.563	0,594	0,625	0.656
ages 6			0006	2007	4299 0:608 123	4019 0.692 108	3772 0.781 95	3550 0.876 85	3354 0.976 76		
e see p	lections		1000	2004	3860 0.547 110	3608 0.623 97	3385 0.703 85	3185 0.789 76	3008 0.879 68	2845 0.973 61	
is tabl	um De	e=-t	1600	2004	3422 0.486 98	3197 .0.553 86	2998 0.625 76	2819 0.701 67	2661 0.781 60	2516 0.865 54	2385 0.954 49
n of th	Maxim in Pou	ndicate	2002	0001	3203 0.456 92	2991 0.519 80	$\frac{2805}{0.586}$	2637 0.657 63	2488 0.732 56	2352 0.811 50	2229 0.895 45
anatio	ls, and Stresses	ıch, as i	1400	0021	2983 0.426 85	2785 0.484 75	2611 0.547 66	2454 0.613 58	2315 0.684 52	2187 0.757 47	2072 0.835 42.
III expl	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	Square Inch, as indicated	1200	7000	2764 0.395 79	2580 0.450 69	2418 0.508 61	2271 0.570 54	$\frac{2142}{0.635}$	2023 0.703 43	1915 0.775 39
For fu	Loads in	ν <u>α</u>	1900	1200	2545 0.365 73	2374 0.415 .64	2224 0.469 56	2088 0.526 50	1968 0.586 44	1858 0.649 40	1758 0.716 36
	l Safe J		1 100	2007	2325 0.334 66	2169 0.381 58	2031 0.430 51	1906 0,482 45	1795 0.537 41	1694 0.595 36	1602 0.656 33
	Tota		1000	2007	2106 0.304 60	1963 0.346	1837 0.391 46	1723 0.438 41	$\frac{1622}{0.488}$	1529 0.541 33	1445 0.596 29
	D _o ctor.	ence Num-			00	-0100	H 69 69	67 69	-00	~0.00	
	Ratio of Span	Depth of Surfaced Timber	I/h		13.3	14.2	15.1	16.0	16.9	17.8	18.7
		Span		Ff	15	16	17	18	19	20	21
	Weight per Lineal Foot	On Green Timber at 38	lbs. per cu. ft.)	Lbs.			5.788	1.276			
	Section Modu-	bh²	9	In.3			49.36	1.324			
nued.	Moment of Inertia	bh³	12	In.4			333.18	1.372		_	
20-Continued	Area Cross Section	A=bh		Sq. In.		Andrew Committee	21.94	1.276			
	Size	Surfaced SIS1E	or S4S	In.			18x133				
TABLE	50	Rough		In.			2x14		-		

0.688	0.719	0.750	0.781	0.813		0.344	0 375	0.406	0.438
					1.32 0.96				6107 0.462 164 185
					1.32			5924 0.358 171 179	.5487 0.416 147
					1.32 0.96 1.04		5707 0.271 178 172	5256 0.318 152	4867 0.370 130
2116 0.981 41					1.32 0.96 1.04	5843 0.214 199 176	5346 0.254 167	4923, 0,299 142	4557 0.347 122
1966 0.915 38	: : :				1.32 0.96 1.04	5449 0.200 186 164	4984 0.237 156	4589 0.279 132	4247 0.324 114
1817 0.850 35	1727 0.930 32				1.32 0.96	5054 0.185 172 153	4622 0.221 144	4255 0.259 123	3937 0.300 105
1667 0.785 32	1584 0.858 30	$\frac{1506}{0.934}$			1.32 0.96	4660 0.171 159 141	4260 0.204 133	3921 0.239 113	3627 0.277 97
1518 0.719 30	1441 0.787 27	1369 0.857 24	1303 0.929 22		1.32 0.96 1.04	4265 0.157 145 . 129	3899 0.187 122	3587 0.219 103	3317 0.254 89
$\begin{array}{c} 1368 \\ 0.654 \\ 27 \end{array}$	1298 0.715 24	1232 0.779 22	0.844	0.914 118	1.32 0.96 1.04	3871 0.143 132 117	3537 0.170 111	3253 0.199 94	3007 0.231 81
-0100	c1 co	07 m	-0760	-0100	L014	-01004	H01004	H 60 60 4	10004
19.6	20.4	21.3	22.2	23.1	Multiplying Factor	80 70	6.3	10.1	10.8
22	23	24	25	26	Mult	=	12	13	14
		5.788	1.276				6.648	1.271	
		49.36	1.324				65.07	1.311	
	_	333.18	1.372				504 28	1.353	
		21.94	1.276				25.19	1.271	
-		18x133					100 101 100 100 100		
		2x14					2x16		

(Table 20 Continued on Next Page.)

s to 70.	Deflec- tion equiv- alent to 1/32	nch per Foot of Span	D	In.	0.469	0.500	0.531	0.563	0.594	0.625	0.656
For full explanation of this table see pages 68 to 70.	.g			5000	5684 0.530 142	5316 0.603 125	4991 0.681 110	4700 0.763 98	4440 0.850 88	4207 0 942 79	
le see 1	flection			1800	5106 0.477 128	4774 0.543 112	4481 0.613 99	4218 0.687 88	3983 0.765 79	3773 0.848 71	3581 0.935 64
nis tab	Total Safe Loads in Pounds, and Maximum Deflections Inches, for Unit Stresses in Pounds per Sames Inch as indirectal	3		1600	4527 0.424 113	4232 0.483 99	3970 0.545 88	3736 0.611 78	3527 0.680 70	3339 0 754 63	3167 0.831 57
on of tl	Maxim Son Pour	marcare		1500	4238 0.398 106	3961 0.453 93	3715 0.511 82	3495 0.572 73	3299 0.637 65	3122 0 706 59	2961 0.779 53
lanati	in Pounds, and Maxim for Unit Stresses in Pou	Tear, as		1400	3949 0.371 99	3689 0.422 86	3460 0.477 76	3254 0.534 68	3070 0.595 61	2905 0.659 54	2754 0.728 49
ull exp	in Pour for Unit	il mare t		1300	3660 0.345 91	3418 0.392 80	3205 0.443 71	3013 0.496 63	2842 0.552 56	2688 0 612 50	2547 0.676 45
For f	Loads Inches,	2	0007	1200	3370 0.318 84	3147 0.362 74	2949 0.409 65	2772 0 458 58	$\frac{2614}{0.510}$	2471 0 565 46	2340 0.624 42
	al Safe			110	3081 0.292 77	2876 0.332 67	2694 0.375 59	2531 0 420 53	2385 0.468 47	2254 0 518 42	2134 0.572 38
			900	1000	2792 0.265 70	2605 0.302 61	2439 0.341 54	2290 0 382 48	2157 0.425 43	2037 0 471 38	1927 0.520 34
	Refer-	Num- ber			4000	- C7 C0	H 63 69	1 27 60	-0100	35	- c3 co
	Ratio of Span to	Deptn of Surfaced Timber	17.7		11.6	12.4	13.2	13.9	14.7	15.5	16.3
	5	opan		Ff.	10	16	17	_	19	30	21
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			6.648	1.271			
	Section Modu- lus	bh²	9	In.3			65.07	1,311			
inued.	Moment of Inertia	bh³	12	In.4			504.28	1.353		-	
20-Continued	Area Cross Section	A=bh		Sq. In.			25.19	1 271	1-100	-	
	Size	Surfaced. S1S1E	or S4S	In.			1§x15½				
TABLE	7.	Rough		In.			2x16				

0.688	0.719	0.750	0.781	0.813	0.844	0.875		0.375	0.406	
							1.31			
							1.31			
3009 0.912 51	2865 0.997 47						1.31		6705 0.282 172 180	
2812 0.855 48	2676 0.935 44						1.31	6822 0.225 190 182	6280 0.265 161	
2615 0.798 45	2487 0.872 41	2371 0.950 37			: : :		1.31 0.97 1.03	6361 0.210 177 170	5855 0.247 150	
2418 0.741 41	2299 0.810 38	2190 0.882 34	2091 0.958 31				1.31	5900 0.195 164 158	5430 0.229 139	
2220 0.684 38	2110 0.748 34	2010 0.814 31	0.884	1830 0.956 26			1.31 0.97 1.03	5440 0.180 151 146	5004 0.212 128	ge.)
2023 0.627 34	1922 0.686 31	1829 0.746 29	0.811	1663 0.876 24	1588 0.945 22		1.31	4979 0.165 138 134	4579 0.194 117	xt Pa
1826 0.570 31	1733 0.623 28	1648 0.679 26	1570 0.737 24	0.796 0.796	1427 0.859 20	1364 0.923 18	1.31 0.97 1.03	4518 0.150 125 122	4154 0.176 106	on Ne
- 63 65	~ ≈ ≈	~ 67 60	-0789	-00	-00	-0100	-0.4	⊣ ∞∞4	-01004	tinued
17.0	17.8	18.6	19.4	20.1	20.7	21 7	Multiplying Factor	8.2	8	(Table 20 Continued on Next Page.)
23	23	24	25	56	27	& &1	Mult	12	13	(Tabl
			6.648	1.271				7.505	1.265	
			65.07	1.311				82.94	1.303	
			504.28	1.353				725.75	1.340	
			25.19	1.271				28.44	1.265	
			18x151					18x172		
			2x16					2x18		

TABLE 20-Continued.

8 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	In.	0.438	0.469	0.500	0.531	0.563	0.594	0.625
ages 6				2000			6790 0.534 141 182	6374 0.603 125	6007 0.676 111	5677 0.753 100	5378 0.834 90
le see j	Total Safe Loads in Pounds, and Maximum Deflections in Reference Equare Inch, as indicated Number		. 1800		6522 0.423 145 175	6099 0.481 127	5724 0.543 112	5393 0.609 100	5095 0.678 89	4825 0.751 80	
is tab	um Del			1600	6215 0.327 148	5785 0.376 129	5408 0.427 113	5074 0.482 100	4779 0.541 89	4513 0.603 79	4272 0.668 71
n of th	Maxim in Pour	Icaned		1500	5820 0.307 139	5416 0.352 120	5063 0.401 106	4749 0.452 93	4472 0.507 83	4222 0.565 74	3996 0.626 67
lanatic	ls, and Stresses	, as ind		1400	5425 0.287 129	5047 0.329 112	4717 0.374 98	4423 0.422 87	4164 0.473 77	3931 0.527 69	3720 0.584 62
ull exp	Pounc or Unit			1300	5030 0.266 120	4679 0.305 104	4372 0.347 91	4098 0.392 80	3857 0.440 71	3640 0.490 64	3443
For f	loads in	The state of the s		1200	4635 0.246 110	4310 0.282 96	4026 0.321 84	3773 0.362 74	3550 0.406 66	3349 0 452 59	3167 0.501 53
	Safe I			1100	4240 0.225 101	3942 0.258 88	3681 0.294 77	3448 0.332 68	3243 0.372 60	3058 0.414 54	2890 0.459 48
	Tota			1000	3845 0.205 92	3573 0.235 79	3335 0.267 69	3123 0.301 61	2936 0.338 54	2767 0.377 49	2614 0.417 44
	Refer-	Num- ber			67 69	-01004	≈ ¢1 co 4	1200	c3 c0	c1 co	-0100
	Ratio of Span to	of of Surfaced Timber	q/2		9.6	10.3	11.0	11 7	12.3	13 0	13.7
	0	opan		Ff.	14	15	16	17	100	19	20
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lba.				7 505			
	Section Modu- lus	bh²	9	In.3				×2 94 1,303		_	
inued.	Moment of Inertia	bh³	12	In.4				725.75			
-Continued	Area Cross Section	A==bh		Sq. In.				25 44 1.265			•
LE 20-	Size	Surfaced	or S4S	In.				1§x17½			_
TABLE	32	Rough	7777	In.			-	2x18			_

0.656	0.688	0.719	0.750	0.781	0.813	0.844	0.875	906.0	0.938	
5106 0,920 81				: : :						1.30
4580 0.828 73	4357 0.909 66	4154 0.994 60								1.30
4053 0.736 64	3854 0.808 58	3673 0.884 53	3503 0.961 49	: :						1.30 0.97 1.03
3790 0.690 60	3603 0.758 55	3433 0.829 50	3273 0.901 45	$\frac{3129}{0.979}$						1.30
3527 0 644 56	3352 0.708 51	3193 0.773 46	3043 0 841 42	2907 0.914 39	2783 0.987 36			: : :		1.30 0.97 1.03
3264 0.598 52	3101 0.657 47	2952 0.718 43	2813 0.781 39	2686 0.848 36	2570 0.917 33	2459 0.989 30				1.30
3000 0,552 48	2849 0.606 43	2712 0.663 39	2582 0.721 36	2465 0.783 33	2357 0.846 30	2255 0.913 28	2160 0.982 26			1.30
2737 0.506 43	2598 0.556 39	2471 0 608 36	2352 0.661 33	2244 0.718 30	2145 0.775 28	2050 0.837 25	1963 0.900 23	1879 0.965 22		1.30 0.97 1.03
2474 0.460 39	2347 0.505 36	2231 0.552 32	2122 0.601 29	2023 0.652 27	1932 0.705 25	1845 0.761 23	1765 0.818 21	1688 0.877 19	1618 0.939 18	1.30
355	-00	-0100	-0.00	÷000	-000	-0.00	1 2 2 3 3 3	67 65	- 67 65	H 57 44
14.4	15.1	15.8	16.5	17.1	17.8	18.5	19.2	19.9	20.6	Multiplying Factor
21	22	23	24	25	26	27	500	29	30	Mult
					7.505					
					82.94					
					725.75					
_					1.265					
					15x17½					
					2x18					

(Table 20 Continued on Next Page.)

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For full explanation of this table see pages 68 to 70.

Deflec- tion equiv- alent to 1/32 Inch per Foot of Span	Ω	In.	0.125	0.156	0.188	0.219	0.250	0.281
ii s		2000		0.166 446 183	2778 0.239 309	2375 0.326 226	2071 0.425 173	1835 0.539 136
flection		1800		3006 0.149 401 165	2498 0.215 278	2135 0.293 203	1861 0.383 155	1648 0.485 122
um De		1600	3345 0.0850 558 183	2670 0.133 356	2218 0.191 247	1895 0.261 180	1651 0.340 138	1461 0.431 108
Maxim s in Pou		1500	3135 0.0797 523 172	2502 0.125 334	2078 0.179 231	1775 0.244 169	$\begin{array}{c} 1546 \\ 0.319 \\ 129 \end{array}$	1368 0.404 101
ls, and Stresses		1400	2925 0.0744 0.488 160	2334 0.116 311	1938 0.167 215	1655 0.228 158	1441 0.298 120	1275 0.377 94
Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated			2715 0.0691 453 149	2166 0.108 289	1798 0.155 200	1535 0.212 146	1336 0.276 111	1181 0.350 88
Loads in nches, f		1200	2505 0.0638 418 137	1998 0.0996 267	1658 0.144 184	1415 0.195 135	1231 0.255 103	1088 0.323 81
l Safe		0011	2295 0.0585 383 126	1830 0.0913 244	1518 0.132 168	1295 0.179 123	1126 0.234 94	994
Tota	9	0001	2085 0.0532 348 115	0.0830 0.222	1378 0.120 153	0.163 0.163	1021 0.213 85	901 0.269 67
Reference ence Num-			-004	H €1 80 44	0.00	357	H 67 69	10700
Ratio of Span to Depth of Timber	1/h		8.7	10.9	13.1	15.3	17.5	19.6
Span		14. 14.	4	10	9	7	00	6
Weight per Lineal Foot (Based on Green Timber at 38	lbs. per cu. ft.)	Lbs.			3.630			
Section Modu- lus bh²	9	In.3			12.60			
Moment of Inertia	12	In.4			34.66			
Area Cross Section		Sq. In.		-	13.75			
Size Surfaced Surfaced	or S4S	In.			2½x5½			
Rough		In.			3x6			

.313	344		.156	188	219	250	281	.313	344	
0.3	0.3		0.1	0.1	0.2	0.2	0.2	0.3	0.3	
1644 0.664 110	1488 0.804 90	1.43			4427 0.238 316 178	3864 0.311 242	3425 0.394 190	3075 0.486 154	2786 0.589 127	
1476 0.597 98	1335 0.723 81	1.43			3981 0.215 284 161	3474 0.280 217	3078 0.355 171	2763 0.438 138	2502 0.530 114	
1308 0.531 87	0.643	1.43		4135 0.140 344 167	3535 0.191 253	3083 0.249 193	2731 0.316 152	2450 0.389 123	2218 0.471 101	
1224 0.498 82	1106 0.603 67	1.43		3875 0.131 323 156	3312 0.179 237	2888 0.234 180	2558 0.296 142	2294 0.365 115	2076 0.442 94	
1140	1030 0.563 62	1.43	4847 0.0852 435 175	3614 0.123 301	3088 0.167 221	2693 0.218 168	2384 0.276 133	2138 0.340 107	1934 0.412 88	
1056 0.432 70	953 0.522 58	1.43 0.92 1.09	4035 0.0791 404 162	3354 0.114 280	2865 0.155 205	2498 0.202 156	2211 0.256 123	1982 0.316 99	1792 0.383 81	
972 0.398 65	877 0.482 . 53	1.43 0.92 1.09	3723 0.0730 372 150	3094 0.105 258	2642 0.143 189	2302 0.187 144	2037 0.237 113	1825 0.292 91	1650 0.353 75	
888 0.365 59	800 0.442 48	1.43	3410 0.0669 341 137	2833 0.0963 236	2419 0.131 173	2107 0.171 132	1864 0.217 104	1669 0.267 83	1508 0.324 69	W D
804 0.332 54	724 0.402 44	1.43	3098 0.0608 310 125	2573 0.0876 214	2196 0.119 157	1912 0.156 120	1690 0.197 94	1513 0.243 76	1366 0.294 62	
		1014	1-01604	H01034	₩0100 A	-0°			357	
21.8	24.0	lying	8.0	9.6	11.2	12.8	14.4	16.0	17.6	0
10	11	Multiplying Factor	10	9	~	00	6	10	11	
		1			4.947	1.280				
					23.42	1.366				
	_				87.89	1.456			Autorory	
						1.280				
					22x7½					
					3x8					

(Table 20 Continued on Next Page.)

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to 70.	Deflection equivalent	Inch per Foot of Span	D	In.	0.375	0.406	0.438	0.469		0.219
For full explanation of this table see pages 68 to 70.		de de		2000	2543 0.701 106	2338 0.822 90	2163 0.954 0.77	0	1.37 0.94 1.06	0
e see ps	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per			1800	2283 0.631 95	209S 0.740 81	1940 0.858 69	1800 0.986 60	1.37 1	
is tabl	m Defle			1600	2023 0.561 84	. 1858 0.658 71	1717 0.763 61	1592 0.876 53	1.37	5686 0 151 325 181
on of tl	Maximu ss in Por	incated		1500	1893 0.526 79	1738 0.617 67	1605 0.716 57	1488 0.822 50	1.37	5328 0.141 305 170
planati	oads in Pounds, and Maximum Defle Inches, for Unit Stresses in Pounds per	Equare Inch, as indicated		1400	1762 0.490 73	1617 0.576 62	1493 0.668 53	1383 0.767 46	1.37	4969 0.132 284 159
full exp	Pounds for Uni	lare inc		1300	1632 0.455 68	1497 0.534 58	1382 0.620 49	1279 0 712 43	1.37	4611 0 123 264 147
For 1	oads in Inches,	ība I		1200	1502 0.420 63	1377 0.493 53	0.572 0.572 45	1175 0.657 39	1.37	4253 0,113 243 136
	Safe I			1100	1372 0.385 57	0.452	0.525 41	1071 0.602 36	1.37	3895 0 104 223 125
				1000	1242 0.350 52	1137 0.411 44	1047 0.477 37	0.548 32	1.37 0.94 1.06	3537 0.0942 202 113
		Num-				-00	- 01 50	H 53 55	-04	H61504
	Ratio of Span to	022	H/1.		19.2	20 8	22.4	24.0	Multiplying Factor	∞ ∞
		Span		Ft.	12	133	14	15	Multi	t~
	Weight per Lineal Foot (Based	Green Timber	lbs. per eu.f t.)	Lbs.			4 917			
	Section Modu- lus	S	0	In.8			23 42			
inued.	Moment of Inertia	I-bh3	77	In.4			1 456			
20—Continued.	Area Cross Section	A=bh		Sq. In.	N. Berkelinger		15 75	_		
LE 20	Size	Surfaced S1S1E	01010	In.			22x73			
TABLE	\$	Rough		In.			3xx 82		; []	

0.250	0.251	0.313	0 344	0.375	0.406	0.438	0.469	0.500	0.531
	5518 0 312 245 176	4953 0.385 198	4491 0.465 163	4103 0.554 137	3776 0.650 116	3494 0.754 100	3248 0.866 87	3034 0.985 76	
5591 0.222 280 178	4961 0.281 220	4451 0.346 178	4035 0.419 147	3685 0.499 123	3390 0.585 104	3136 0.678 90	2914 0.779 78	2721 0.886 68	
4964 0 197 248	4403 0.249 196	3950 0.308 158	3579 0 372 130	3267 0.443 109	3004 0.520 92	2778 0.603 79	2580 0.693 69	2407 0.788 60	2253 0.890 53
4651 0 185 233	4125 0 234 183	3699 0.289 148	3351 0.349 122	3059 0.415 102	2812 0.487 87	2599 0.565 74	2413 0.649 64	2251 0.738 56	2106 0.834 50
4336 0 172 217	3846 0.218 171	3448 0.269 138	3123 0.326 114	2850 0.388 95	2619 0.455 81	2419 0.528 69	2245 0.606 60	2094 0.689 52	1958 0.778 46
4024 0.160 201	3567 0 203 158	3197 0.250 128	2895 0.302 105	2641 0.360 88	2426 0.422 75	2240 0.490 64	2078 0.563 55	1937 0.640 48	0.723 43
3711 0.148 186	3288 0.187 146	2947 0.231 118	2667 0.279 97	2432 0.332 81	2233 0.390 69	2061 0.452 59	1911 0.519 51	1780 0.591 45	1663 0.667 39
3397 0.135 170	3010 0.171 134	2696 0.212 108	2439 0.256 89	2223 0.305 74	2040 0.357 63	1882 0.415 54	1744 0.476 47	1624 0.542 41	1516 0.612 36
3084 0.123 154	2731 0.156 121	2445 0.192 98	2211 0.233 80	2014 0.277 67	1847 0.325 57	1703 0.377 49	1577 0.433 42	1467 0.492 37	1368 0.556 32
-0004	— 61 × 4	-0100	-0100	-225	-0.00	H2180	-020	67 65	357
10.1	11.4	12.6	13.9	15.2	16.4	17.7	19.0	20.3	21.5
У.	5.	10	I	13	13	#	15	16	17
				6 270	1.263				
				37.61	1 330				
~				178.62	1 400				
				23.75	1.263				
				2½x9¾					
				3x10					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Foot of Span	D	In.	0.563	169 0		0 250	0.281	0.313
ages 6			0	2000			1.33			
le see i	flection		0 0	1800			1.33			6534 0.286 218 173
ris tab	num Dends per	4	0	1600	2116 0.997 47	7 : :	1.33		6463 0.206 239 170	5799 0.254 193
on of th	Maxin s in Pou		1	0001	1977 0.935 44		1.33	6826 0.153 284 180	0 193 224	5432 0.238 181
lanatio	ds, and Stresses		-	1400	1837 0.873 41	1729 0 972 36	1.33	6366 0 142 265 168	5647 0 180 209	5065 0 222 169
ull exp	in Pounds, and Maxim for Unit Stresses in Pour Souare Inch, as indicated			1300	1698 0.810 38	1597 0.902 34	1.33	5907 0 132 246 156	5239 0.167 194	4698 0.207 157
For f	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated	000	1200	1559 0.748	1465 0.833 31	1.33	5448 0.122 227 144	4830 0.155 179	4330 0 191 144	
1		al Safe		1100	1419 0.686 32	1333 0.764 28	1.33	4989 0.112 208 132	4122 0.142 164	3963 0.175 132
i	Tota		900	1000	1280 0.623 28	1201 0.694 25	1.33 0.95 1.05	4530 0 102 189 120	4014 0.129 149	3596 0 159 120
	Refer-			H 67 69	H 57 69	H 63 44	121004	H 21 02 4	H 03 20 4	
1	Ratio of Span to	Ratio of Span to Depth of Surfaced Timber 1/h				54 0	Multiplying Factor	, xo	£ 6	10 4
	2	ngde -		F.	18	19	Mult	2.	6	9
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		6 270	607.1		7 590	
1	Section Modu- lus	S	9	In.3		37 61	000		55.10 1 306	
inued.	Moment of Inertia	bh³	12	In.4		178.62	700		316 85	
Continued	Area Cross Section	A=bh		Sq. In.		23 75	207		28.75	
LE 20	Size	Surfaced S1S1E	or S4S	In.		2½x91			2½x11½	
TABLE	:22	Rough		In.	B	3x10		1	3x12	

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	0.625
6597 0.384 200 174	6031 0.458 168	5557 0.537 143	5140 0.623 122	4786 0.715 106	4473 0.813 93	4193 0.918 82			
5929 0.346 180	5419 0.412 151	4991 0.483 128	4615 0.561 110	4296 0.643 95	4014 0.732 84	3761 0.826 74	3537 0.927 65	: : :	
5261 0.307 159	4807 0.366 134	4426 0.430 113	4091 0.498 97	3806 0.572 85	3554 0.650 74	3329 0.734 65	3129 0.824 58	2950 0.917 52	
4927 0.288 149	4501 0.343 125	4143 0.403 106	$\frac{3829}{0.467}$	3561 0.536 79	3325 0.610 69	3113 0.688 61	2925 0.773 54	2757 0.860 48	2604 0.953 43
4593 0.269 139	4194 0.320 117	3860 0.376 99	3566 0.436 85	3316 0.500 74	3095 0.569 64	2896 0.643 57	2720 0.721 50	2564 0.802 45	2420 0 889 40
4259 0.250 129	3888 0.297 108	3577 0.349 92	3304 0.405 79	3071 0.465 68	2865 0.528 60	2680 0.597 53	$\begin{array}{c} 2516 \\ 0.670 \\ 47 \end{array}$	2370 0.745 42	2236 0.826 37
3925 0.231 119	3582 0.275 100	3295 0.322 84	3042 0.374 72	2826 0.429 63	2635 0.488 55	2464 0.551 48	2312 0.618 43	2177 0.688 38	2052 0.762 34
3591 0.211 109	3276 0.252 91	3012 0.295 77	2779 0.343 66	2581 0.393 57	2406 0.447 50	2248 0.505 44	2108 0.566 39	1983 0.631 35	1869 0.699 31
3257 0.192 99	2970 0.229 83	2729 0.268 70	2517 0.312 60	2336 0.358 52	2176 0.407 45	2032 0.459 40	1904 0.515 35	1790 0.573 31	1685 0.635 28
-004	- 67 69	-0700	-226	H 67 69	357	00	~ 67 fb	-0100	-010
11.5	12.5	13.6	14.6	15.7	16.7	17.7	18.8	19.8	20.9
=	12	13	14	15	16	17	18	19	20
				7.590	1.252				
-				55.10	1.306				
				316.85	1.364				
				28.75	1.252				
	_			2½x11½					
			-	3x12					

(Table 20 Continued on Next Page.)

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TABLE 20-Continued.

For full explanation of this table see pages 68 to 70.	Deflec- tion equivalent to 1/32	Inch per Foot of Span	А	In.	0.656	0.688	0.719		0.281	0.313
nages (a in			2000			10 A	1.31		
le see 1	flection			1800				1.31		
is tab	num De			1600				1.31		8007 0.216 229 180
n of th	Maxin s in Pou	marcare		1500				1.31 0.95 1.04		7501 0.203 214 169
lanatio	ds, and Stresse	ucu, as l		1400	2291 0.981 36			1.31 0.95 1.04	7792 0.153 247 175	6995 0.189 200
all exp	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stress in Pounds per	duare.		1300	2116 0.911 34	2004 1.000 30		1.31	7230 0.142 230 163	6489 0.176 185
For f	Loads i	2		1200	1941 0.841 31	1837 0.923 28		1.31	6668 0.131 212 150	5983 0.162 171
	al Safe			1100	1766 0.771 28	1670 0.846 25	1583 0.925 23	1.31	6105 0.121 194 138	5477 0.149 .156
				1000	0.701 25.	1503 0.769 23	1423 0.841 21	1.31	5543 0.110 176 125	4971 0.135 142
	Refer-	Num- ber			-000	35	03 to	H014 1	-01004	-004
	Ratio of Span to	Of Of Surfaced Timber	1/h		21.9	23 0	24.0	Multiplying Factor	0.8	9.
	C	obau		Ft.	21	22	23	Multi	6	10
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		7 590	797		8.909	1.245
	Section Modu- lus	S-bh2	9	In.3		55.10	306		75.94	1.291
inued.	Moment of Inertia	bh³	77	In.4		316 85	1.304	,	512.58	1.338
-Continued	Area Cross Section	A=bh		Sq. In.		28 73	707.1		33.75	1.245
LE 20-	Size	Surfaced	OF 1243	In.		2½x11½		· ·	2±x13¾	
TABLE	V.	Rough		In.		3x12			3x14	

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	0.625
		7668 0.457 169 173	7109 0.530 145	6614 0.608 126	6181 0.692 110	5806 0.781 98	5462 0.876 87	5159 0.976 78	
7210 0.295 187 184	7487 0.350 178	6890 0.412 151	6386 0.477 130	5939 0.547 113	5549 0.623 99	$\begin{array}{c} 5210 \\ 0.703 \\ 88 \end{array}$	4900 0.789 78	4626 0.879 70	4378 0.973 63
6398 0.262 166	6643 0.311 158	6111 0.366 134	5662 0.424 116	5264 0 486 100	4916 0.553 88	4614 0.625 78	4338 0.701 69	4093 0.781 62	3872 0.865 55
5992 0.245 156	6222 0.292 148	5722 0.343 126	5301 0.397 108	4927 0.456 94	4600 0.519 82	4317 0.586 73	4057 0.657 64	3827 0.732 58	3619 0 811 52
5586 0.229 145	5800 0.273 138	5333 0.320 117	4939 0.371 101	4590 0.426 87	4284 0.484 77	4019 0.547 68	3775 0.613 60	3561 0.684 54	3365 0.757 48
5180 0.213 135	5378 0.253 128	4944 0.297 109	4577 0.344 93	4252 0.395 81	3968 0.450 71	3721 0.508 63	3494 0.570 55	3294 0.635 50	3112 0.703 44
4774 0.196 124	4956 0.234 118	4554 0.274 100	4215 0.318 86	3915 0.365 75	3651 0.415 65	3423 0.469 58	3213 0.526 51	3028 0.586 46	2859 0.649
4368 0.180 113	4534 0.214 108	4165 0.251 92	3854 0.292 79	3577 0.334 68	3335 0.381 60	3125 0.430 53	2932 0.482 47	2761 0.537 42	2606 0.595 37
3962 0.164 103	4112 0.195 98	3776 0.228 83	3492 0 265 71	3240 0.304 62	3019 0 346 54	2827 0.391 48	2651 0.438 42	2495 0.488 38	2353 0.541 34
c1 c2 4	200	1004	-0.00		₩ 62 62 10 70 11	H 67 69	-00	67 69	67 69
8.6	10.7	11.6	12.4	13.3	14.2	15.1	16.0	16.9	17.8
Ξ	27	13	14	lõ	16	17	18	19	20
				8.909					
				75.94					
				512.58					
				33.75					
				2½x13½					
				3x14					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion rquiv- alent to 1/32	Inch per Foot of Span	Q	In.	0.656	0.688	0.719	0.750	0 781	0 813	
pages	ni su			2000					::.	: : :	1.29
ole see	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Surrasa Irah as indicada per			1800					: .		1.29 0 96 1 04
his tal	mum D unds pe	Ŗ		1600	3669 0.954 50						1.29 0.96 1.04
on of t	d Maxi	Agarom		1500	3428 0.895 47	3256 0.981 42					1.29
lanati	nds, and t Stress	TICH, 88		1400	3187 0,835 43	3025 0.915 39					1.29 0 96 1.04
ull exp	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Services Inch os indicated.	o remon		1300	2946 0.775 40	2795 0.850 36	2656 0.930 33			. : .	1 29 0 96 1 04
For f	Loads Inches,	4	. 70.	1200	2705 0.716 37	2565 0.785 33	2436 0.858 30	2318 0.934 28	::-		1 29 0 96 1 04
	al Safe		3	1100	2464 0.656 34	2335 0.719 30	2216 0.787 28	2107 0.857 25	2003 0 929 23		1.29
			9	1000	2223 0.596 30	2105 0.654 27	1996 0.715 25	1896 0.779 23	1801 0 844 21	1715 0 914 19	1.29
		Num- ber			~00 00	-00	-000	-0100	- 51 55	- 61 65	-24
	Ratio of Span to	of Surfaced Timber	1/h		18.7	19.6	20.4	21.3	01 01 01	- 23	Multiplying Factor
		nada 		Ff.	21	22	23	24	13.	36	Multip
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			000	1.245			
	Section Modu-	bh²	9	In.3			75 04	1 291			
inued.	Moment of Inertia	bh³	12	In.4	3000		9,12	1.338			
-Continued	Area Cross Section	A=bh		Sq. In.			33 75	1.245		-	
93	Size	Surfaced	or S4S	In.			23 x 133	4	_		
TABLE	. J.	Rough		lp.			3x14				

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	0.625
			9395 0.462 168 185	8747 0.530 146	8180 0.603 128	7682 0.681 113	7234 0.763 100	6832 0.850 90	6474 0.942 81
		9114 0.358 175 175	8441 0.416 151	7857 0.477 131	7346 0.543 115	6896 0.613	6492 0.687 90	6129 0.765 81	5806 0.848 73
: [8776 0.271 183 172	8086 0 318 156	7487 0.370 134	6967 0.424 116	$6511 \\ 0.483 \\ 102$	6111 0.545 90	5750 0.611 80	5427 0.680 71	5138 0.754 64
8992 0 214 204 176	\$220 0 254 171	7573 0.299 146	7011 0.347 125	6522 0.398 109	6094 0.453 95	5718 0.511 84	5380 0.572 75	5076 0.637 67	4805 0.706 60
8385 0.200 191 164	7664 0.237 160	7059 0.279 136	6534 0.324 117	6077 0.371 101	5677 0.422 89	5325 0.477 78	5009 0.534 70	4724 0.595 62	4471 0.659 56
0.185 177 153	7108 0.221 148	6545 0.259 126	6057 0.300 108	5632 0.345 94	5260 0.392 82	4932 0.443 73	4638 0.496 64	4373 0.552 58	4137 0.612 52
0.171 0.171 163 141	6551 0.204 137	6031 0.239 116	5580 0.277 100	5187 0.318 87	4842 0 362 76	4540 0.409 67	4267 0.458 59	4022 0.510 53	3803 0.565 48
6564 0.157 149 129	5995 0.187 125	5518 0.219 106	5103 0.254 91	4742 0.292 79	4425 0.332 69	4147 0.375 61	3896 0.420 54	3670 0.468 48	3469 0.518 43
5957 0.143 135 117	5439 0.170 113	5004 0.199 96	4626 0.231 83	4297 0.265 72	4008 0.302 63	3754 0.341 55	3525 0.382 49	3319 0.425 44	3135 0.471 39
H01204	22 00: 4	~ c) co 4	-0254	100	-228	~~~	-22	0.00	2 63 65
.c.	6.3	10.1	10.8	11.6	12.4	13.2	13 9	14.7	15.5
Ξ	<u> </u>	52	#	15	16	17	18	19	30
				10.32					
				100.10					
				1.321					
~				38.75					
	-			24x154					
-		-		3x16					

(Table 20 Continued on Next Page.)

Deflec-tion equiv-alent to 1/32 Inch per Foot of Span 0.688 0.719 0.750 0.844 explanation of this table see pages 68 to 70. 656 813 781 In. А 0 2000 Total Safe Loads in Pounds, and Maximum Deflections in 5509).935 66 1800 0 Inches, for Unit Stresses in Pounds per 4873 0.831 58 4631 0.912 53 4408 0.997 48 1600 Square Inch, as indicated 4328 0.855 49 1500 4237 0.728 50 4024 0.798 3828 0.872 3648 0.950 1400 3919 0.676 47 3538 0.810 38 3215 .958 32 1300 full 3417 0.684 39 3247 0.748 35 3601 0.624 43 3092 0.814 32 2948 0.884 29 2817 0.956 27 1200 For 2957 0.686 32 3114 0.627 35 2814 0.746 29 2560 2443 0.945 2681 .811 .27 1100 2810 0.570 32 2965 0.520 35 2667 0.623 29 2536 0.679 26 2196 0.859 20 2414 0.737 24 2303 0.796 22 0001 Reference Num--1000 -0300 -10700 -10700 -0200 - 02 m - 03 00 Surfaced Ratio of Span to Depth of 17.0 16.3 00 9.81 4.61 q/2 0 8 22 24 22 26 per Lineal Foot Based Green Timber at 38 lbs. per cu. ft.) 239 OD Lbs. Section Modu-100,10 279 In.3 8 Moment of Laertia pp_{g} 775.81 20-Continued. Area Cross Section In. A=bh 239 38. 89 SISIE or S4S 24x153 In. TABLE Size In.

0.875		0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	
	1 28 0.97 1.03					10453 0.534 145 182	9814 0.603 128	9246 0.676 114	8739 0.753 102	
	1.28				10037 0.423 149 175	9389 0.481 130	8813 0.543 115	8301 0.609 103	7843 0.678 92	
	1 28 0.97 1.03		10319 0.282 176 180	9564 0.327 152	8902 0.376 132	8325 0.427 116	7812 0.482 102	7355 0.541 91	6947 0.603 81	
	1.28 0.97 1.03	10497 0.225 194 182	9665 0.265 165	8956 0.307 142	8335 0.352 123	0.401 108	7312 0.452 96	6883 0.507 85	6500 0.565 76	
	1.28	9788 0.210 181 170	9010 0.247 154	8348 0.287 133	7768 0.329 115	7262 0.374 101	6811 0.422 89	6410 0.473 79	6052 0.527 71	
	1.28 0.97 1.03	9079 0.195 168 158	8356 0.229 143	7740 0.266 123	7201 0.305 107	6730 0.347 93	6311 0.392 83	5937 0.440 73	5604 0.490 66	
	1.28 0.97 1.03	8370 0.180 155 146	7702 0.212 132	7133 0.246 113	6633 0.282 98	6198 0.321 86	5810 0.362 76	5464 0.406 67	.5156 0.452 60	ge.)
	1.28 0.97 1.03	7661 0.165 142 134	7047 0.194 121	6525 0.225 104	6066 0.258 90	5666 0.294 79	5310 0.332 69	4992 0.372 62	4708 0.414 55	Next Page.
2098 0.923 19	1 28 0.97 1.03	6952 0.150 129 122	6393 0.176 109	5917 0.205 94	5499 0.235 82	5134 0.267 71	4809 0.301 63	4519 0.338 56	4260 0.377 50	on N
- 61 m	-04	10004	C3 CQ 44	-000	-0.004	- cz cz 4			-220	Continued on
21.7	Multiplying Factor	80.2	8.9	9.6	10.3	11.0	11.7	12.3	13.0	8
58	Mult	12	13	14	15	16	17	18	19	(Table
					11.54					
					127 60					
****		6			1116.54					
		1			43.75					
	***************************************	u 			22x172					
					3x18					

95

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	Q	In.	0.625	0.656	0.688	0.719	0.750	0.781	0.813
ages 6	s in			2000	8277 0.834 92	7860 0 920 83					: : .
le see I	effection			1800	7426 0.751 83	7050 0.828 75	6710 0.909 68	6395 0.994 62			
is tab	num De	Q.		1600	6575 0.668 73	6240 0.736 66	5936 0.808 60	5655 6,884 55	5395 0.961 50		
on of th	l Maxir s in Pou	moreage		1500	6150 0.626 68	5835 0.690 62	5550 0.758 56	5285 0.829 51	5041 0.901 47	4817 0.979 43	
lanatio	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per	nen, sa		1400	5725 0.584 64	5429 0.644 57	5163 0.708 52	4915 0.773 47	4686 0.841 43	4476 0.914 40	4281 0.987 37
ull exp	in Pour	r ayen b		1300	5299 0.543 59	. 5024 0.598 53	4776 0.657 48	4545 0.718 44	$\frac{4332}{0.781}$	$4136 \\ 0.848 \\ 37$	3954 0.917 34
For f	Loads Inches,	2		1200	4874 0.501 54	4619. 0.552 49	4389 0.606 44	$\frac{4175}{0.663}$	3977 0.721 37	3796 0.783 34	3625 0 846 31
	al Safe	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		0011	4448 0.459 49	4214 0.506 45	4002 0.556	3805 0.608 37	3623 0.661 34	3455 0.718 31	3299 0,775 28
				1000	4023 0.417 45	3809 0.460 40	3615 0.505 37	3435 0.552 33	3268 0.601 30	$\frac{3115}{0.652}$	2972 0.705 25
	Refer-	Num- ber				1000	~6760	957	3 5 7	22.60	357
	Ratio of Span to	Of Of Surfaced Timber	q/2		13.7	14 4	15.1	15.8	16.5	17.1	17.8
		Daga 		Ft.	20	21	22	23	24	501	26
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			11 54	1 234			
	Section Modu- lus			In.3			127 60	1 269			
nued.	Moment of Inertia			In.4			1116 54	1 306			
20-Continued	ize Cross Section Surfaced SISIE A=bb			Sq. In.			43.75				-
			or S4S	In.			23×173				
TABLE	₩	Size Sur Rough Sur or		In.	Y		3x18				

0.844	0.875	906.0	0.938		0.0938	0.125	0.156	0.188	0.219	ı
	: : :			1.27 0.97 1.03		2371 0.167 445 146	1892 0.261 284	1571 0 376 197	1339 0.512 144	1.49
				1.27 0.97 1.03	2850 0.0845 712 175	2133 0.150 400	1701 0.235 255	0.339 177	1203 0.461 129	1.49
		: : :	: : :	1.27 0.97 1.03	2532 0752 633 156	1894 0.134 355	1510 0.209 226	1253 0.301 157	1067 0.409 114	1.49
				1.27 0.97 1.03	2374 0.0705 0. 594 146	0.125	1415 0.196 212	1174 0.282 147	0.384 107	1.49
				1.27 0.97 1.03	2215 0.0658 554 136	1656 0.117 311	1320 0.183 198	1094 0.263 137	930 0.358 100	1.49
3784 0.989 31			: : :	1.27 0.97 1.03	2056 0.0610 514 127	1537 0 109 288	1224 0.170 184	1015 0.245 127	862 0.332 92	1.49 0.87 1.14
3469 0.913 29	3325 0.982 26			1.27 0.97 1.03	1897 0.0564 474 117	1417 0.100 266	1129 0.157 169	935 0.226 117	794 0.307 85	1.49 0.87 1.14
3154 0.837 26	3021 0.900 24	2892 0.965 22		1.27 0.97 1.03	1738 0.0517 435 107	1298 0.0919 244	1033 0.144 155	856 0.207 107	726 0.281 78	1.49 0.87 1.14
2839 0.761 23	2717 0.818 22	2599 0.877 20	2491 0 939 18	1.27	1579 0.0470 395 97	0.0835	938 0.131 141	0.188 97	658 0.256 71	1.49
357	-00	-200	3 52 →	-04	1004	12684	- 0100	- 03 80	-0100	H014
18.5	19.2	19.9	20.6	Multiplying Factor	10.3	13.7	17.1	20.6	24.0	Multiplying Factor
27	28	53	30	Mult	65	7	ro	9	1	Mult
_		11.54	1.234				3.231			
		127.60	1.269				7.15			
		1116.54	1.306			ERR-PLATES	12.51			
	- 10	43.75	1.234				12.25			
		23x173					33x31			
		3x18					4x4			

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Defico- tion equiv- alent	Inch per Foot of Span	D	In.	0.125	0.156	0.188	0.219	0.250	0.281
pages	s in			2000		4679 0.166 468 183	-3890 0.239 324	3326 0.326 237	2899 0.425 181	2568 0 539 143
le see	flection			1800		4209 0.149 421 165	3498 0.215 291	2990 0.293 214	2605 0 383 163	2307 0.485 128
bis tab	num De	ಶ		1600	4684 0 0850 586 183	3738 -0.133 374	3106 0.191 259	2654 0.261 190	2311 0.340 145	2045 0.431 114
on of t	l Maxir	ndicate		1500	4390 0.0797 549 172	3503 0.125 350	2910 0.179 243	2486 0.244 178	2164 0.319 135	1915 0.404 106
lanati	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	Square Inch, as indicated		1400	4096 0.0744 512 160	3268 0.116 327	2714 0.167 226	2317 0.228 165	2017 0.298 126	1784 0.377 99
ull exp	in Pour for Unit	quare Is		1300	3802 0.0691 475 149	3033 0_108 303	2518 0 155 210	2149 0 212 153	$0.276 \\ 0.276 \\ 117$	1653 0.350 92
For f	Loads Inches,	ΣĎ.		1200	3508 0.0638 438 137	2797 0.0996 280	2322 0.144 194	1981 0 195 142	1723 0.255 108	1522 0.323 85
	al Safe			1100	3214 0 0585 402 126	2562 0.0913 256	2126 0 132 177	1813 0 179 130	1576 0 234 99	1392 0.296 77
				1000	2920 0 0532 365 115	2327 0 0830 0. 233	1930 0 120 161	1645 0 163 118	1429 0.213 89	1261 0.269 70
		Refer- ence Num- ber			111 01 00 4 4	₩ 63 W 44	H 67 65	- 0100	-000	357
	Ratio of Span to	Depth of Surfaced Timber	q/1		8 7	10.9	13.1	15 3	17.5	19.6
		Span		Ft.	4	rċ	9	7	£	ф.
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			5 080			
	Section Modu- lus	S	0	In.8		_	17 64			
inued.	Moment of Inertia	II	77	In.4			1.484			_
-Continued	Area Cross Section	A==bh		Sq. In.			19 25			
LE 20-	Size	Surfaced S1S1E	07 70	In.			32x51			
TABLE	U.	Rough		In.	-		4x6			-

0 313	0.344		0.156	0.188	0.219	0.250	0.281	0.313	0.344	
2301 0.664 115	2082 0.804 95	1.36 0.92 1.09			6203 0.238 332. 178	5415 0.311 254	4800 0.394 200	4307 0.486 162	3902 0.589 133	
2066 0.597 103	1868 0.723 85	1 36 0 92 1 09			5578 0.215 299 161	4868 0.280 228	4314 0.355 180	3869 0.438 145	3504 0.530 119	
1831 0 531 92	1654 0.643 75	1.36		5795 0 140 362 167	4953 0.191 265	4321 0.249 203	3828 0.316 159	3432 0.389 129	3106 0.471 106	
1713 0.498 86	1548 0.603 70	1.09		5430 0 131 339 156	4640 0.179 249	4048 0.234 190	3585 0.296 149	3213 0.365 121	2908 0.442 99	
1595 0.465 80	1441 0.563 66	1.36	6094 0.0852 457 175	5065 0.123 317	4327 0.167 232	3774 0.218 177	3341 0.276 139	2994 0.340 112	2709 0.412 92	
1478 0.432 74	1334 0.522 61	1.36 0.92 1.09	5656 0.0791 424 162	4700 0.114 294	4015 0.155 215	3501 0.202 164	3098 0.256 129	2775 0.316 104	2510 0.383 86	
1360 0.398 68,	1227 0.482 56	1.36 0.92 1.09	5219 0.0730 392 150	4336 0.105 271	3702 0.143 198	3227 0.187 151	2855 0.237 119	2557 0.292 96	2311 0.353 79	ge.)
1243 0.365 62	0.442 0.442 51	1.36	4781 0.0669 359 137	3971 0.0963 248	3390 0.131 182	2954 0.171 139	2612 0.217 109	2338 0.267 88	2112 0.324 72	ext Pa
1125 0.332 56	1013 0.402 46	1.36 0.92 1.09	4343 0.0608 326 125	3606 0.0876 225	3077 0.119 165	2680 0.156 126	2369 0.197 99	2119 0.243 79	1913 0.294 65	on Ne
	-0100	-24	1004	-0.004	-264	0100	07 00	-000	m 64 55	tinued
21.8	24 0	Multiplying Factor	8.0	9.6	11.2	12.8	14.4	16.0	17.6	20 Continued on Next Page.
23	11	Multi Fac	10	σ	-	00	6	10	11	(Table
						1.219				
				-		1.300				
			,	Art Parent		123.05		-		
	to the second					1.219				
nerec					î	32X72				
-						XX XX				

99

TABLE 20-Continued.

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	In.	0.375	0 406	0.438	0.469		0 219
ages 6				2000	3563 0.701 111	3276 0.822 95	3029 0.954 81		1.30 0.94 1.06	
le see I	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresse in Pounds per			1800	3198 0.631 100	2939 0.740 85	2716 0.858 73	2522 0.986 63	1.30 0.94 1.06	
is tab	num De	=		1600	2834 0.561 89	2603 0 658 75	2404 0.763 64	2230 0.876 56	1.30 0.94 1.06	7966 0.151 341 181
n of th	Maxin s in Pou	nulcave		1500	2652 0.526 83	2435 0 617 70	2248 0.716 60	2085 0.822 52	1.30 0.94 1.06	7465 0.141 320 170
lanatic	Loads in Pounds, and Maximum De Inches, for Unit Stresse in Pounds per	ich, as 1.		1400	2469 0.490 77	2266 0 576 65	2091 0.668 56	1939 0.767 48	1.30 0.94 1.06	6963 0.132 299 159
ull exp	n Poun	m aren i		1300	2287 0.455 71	2098 0 534 61	1935 0.620 52	1793 0.712 45	1.30	6461 0.123 277 147
For ft	Loads i	<u> </u>		1200	2105 0.420 66	1930 0 493 56	0.572 48	1647 0.657 41	1.30	5959 0.113 255 136
	il Safe			1100	1922 0.385 60	1761 0 452 51	1622 0.525 43	1501 0.602 38	1.30	5458 0.104 234 125
			3	1000	1740 0.350 54	1593 0 411 46	1466	1355 0.548 34	1.30	4956 0.0942 212 113
	Refer-				-00	H 0100	- 01 00	-0100	104	-01004
	Ratio of Span to	₽.,			19.2	20 8	22.4	24.0	Multiplying Factor	× × ×
		n sejo		Pt.	12	55	41	10	Multi	t~
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			6 928			
	Section Modu- lus	S=	9	In.3			32 81 1.300			
nued.	Moment of Inertia	bh³ I=	12	In.4			123 05			
-Continued	Area Cross Section	A=bh		Sq In.		~	26 25		,	***************************************
UE 20	Size	Surfaced	or 548	In.			31x71		1	
TABLE	82	Rough		In		_	4x8	~		

0.250	0.281	0.313	0.344	0.375	0.406	0.438	0.469	0.500	0.531	
	7723 0.312 258 176	6934 0.385 208	6287 0.465 172	5749 0.554 144	5288 0.650 122	4895 0.754 105	4550 0.866 91	4248 0.985 80		
7832 0.222 294 178	6943 0 281 231	6232 0.346 187	5649 0.419 154	5164 0.499 129	4748 0.585 110	4393 0.678 94	4082 0.779 82	3809 0.886 71		
6954 0.197 261	6163 0.249 206	5530 0.308 166	5010 0.372 137	4578 0.443 114	4208 0.520 97	3891 0.603 83	3614 0.693 72	3370 0.788 63	3155 0.890 56	
6515 0.185 244	5773 0.234 192	5179 0.289 155	4691 0.349 128	4286 0.415 107	3938 0.487 91	3641 0.565 78	3380 0.649 68	3151 0.738 59	2949 0.834 52	
6076 0.172 228	5382 0.218 179	4827 0.269 145	4372 0.326 119	3993 0.388 100	3667 0.455 85	3390 0.528 73	3145 0.606 63	2932 0.689 55	2742 0.778 48	
5637 0 160 211	4992 0.203 166	4476 0 250 134	4053 0.302 111	3700 0.360 93	3397 0.422 78	3139 0.490 67	2911 0.563 58	2712 0.640 51	2536 0.723 45	
5198 0.148 195	4602 0.187 153	4125 0.231 124	3733 0.279 102	3407 0.332 85	3127 0.390 72	2888 0.452 62	2677 0.519 54	2493 0.591 47	2329 0.667 41	ge.)
4759 0.135 178	4212 0.171 140	3774 0.212 113	3414 0.256 93	3115 0.305 78	2857 0.357 66	2637 0.415 57	2443 0.476 49	2373 0.542 45	2123 0.612 37	at Pa
4320 0.123 162	3822 0.156 127	3423 0, 192 103	3095 0.233 84	2822 0.277 71	2587 0.325 60	2386 0.377 51	2209 0.433 44	2054 0.492 39	1916 0.556 34	on Ne
1004	H 57 85 4	H 61 89	- 0.00	-26	- 22 65	H 61 60	₩ 63 FG	220	3 5 1	tinued
10.1	11 4	12 6	13.9	15 2	16.4	17.7	19.0	20.2	21.5	Table 20 Continued on Next Page.
20	6	10	Π	12	13	17	15	16	17	(Table
				8.775						
				52.65						
				1.332						
				33.25						
				$3\frac{1}{2}x9\frac{1}{2}$						
				4x10						

0.594

27 95 05

-0-

0.250

0.281

0.313

563

In.

2000

tion equiv-alent to 1/32 Inch per Foot of Span

n.

For full explanation of this table see pages 68 to 70. Total Safe Loads in Pounds, and Maximum Deflections 9146 0.286 229 173 1800 27 95 05 -0-Inches, for Unit Stresses in Pounds per 2964 2045 251 170 8118 0.254 203 1600 27 95 05 -0-Square Inch, as indicated 2769 0.935 46 7604 0.238 190 1500 8474 0.193 235 27 95 05 2420 0.972 38 7902 0.180 220 7090 .222 .177 1400 27 95 05 -0-0 2378 0.810 40 2235 0.902 35 7331 0.167 204 6576 0.207 164 1300 95 95 05 -0-2183 0.748 36 2051 0.833 32 1200 6760 0.155 188 6062 0.191 152 27 95 05 -0-1988 1866 0.764 29 6985 0.112 218 132 1100 27 95 05 -0-1793 0.623 30 6342 0.102 198 120 5617 0.129 156 694 694 27 5034 0.159 126 0001 95 27 0 -0-Reference Num-- 07 00 -0700 -04 -21004 -000 Surfaced Ratio of Span to Depth of Multiplying Factor 9 24 90 10 Span Ff 18 6 00 Timber lbs. per cu. ft.) per Lineal Foot (Based Green Weight at 38 OIL 203 Lbs. 1,193 Section Modu-52,65 265 245 In,3 Moment Inertia 20-Continued. 332 443 59 299 Area Cross Section ln. 33.25 203 40.25 193 Š. 32x9½ SISIE or SAS 32x112 In. TABLE Size 4x12

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	594	0.625
_	0.	0.	0	0.	0.	0	0.	0	0
9231 0.384 210 174	8441 0.458 176	7774 0.537 150	7197 0.623 129	6699 0.715 112	6256 0.813 98	5867 0.918 86			
8296 0.346 189	7584 0.412 158	6983 0.483 134	6462 0.561 115	6013 0.643 100	5613 0.732 88	5262 0.826 77	4953 0.927 69		
7361 0.307 167	6727 0.366 140	6192 0.430 119	5728 0 498 102	5327 0.572 89	4971 0.650 78	4657 0.734 69	4382 0.824 61	4131 0.917 54	
0.288 0.288 157	6299 0.343 131	5796 0.403 111	5361 (),467 96	4985 0.536 83	4650 0.610 73	4355 0.688 64	4096 0.773 57	3860 0.860 51	3645 0.953 46
0.269 146	5871 0.320 122	5400 0.376 104	4993 0.436 89	4642 0.500 77	4328 0.569 68	4053 0.643 60	3810 0.721 53	3589 0.802 47	3387 0.889 42
5959 0 250 135	5442 0.297 113	5005 0.349 96	4626 0.405 83	4299 0.465 72:	4007 0.528 63	3750 0.597 55	3524 0.670 49	3318 0.745 44	3130 0.826 39
5492 0.231 125	5014 0.275 104	4609 0.322 89	4259 0.374 76	3956 0.429 66	3686 0.488 58	3448 0.551 51	3239 0.618 45	3048 0.688 40	2873 0.762
5024 0 211 114	4585 0.252 96	4214 0.295 81	3891 0.343 69	3613 0.393 60	3364 0.447 53	3145 0.505 46	2953 0.566 41	2777 0.631 37	2616 0.699 33
4557 0.192 104	4157 0.229 87	3818 0.268 73	3524 0.312 63	3270 0.358 55	3043 0.407 48	2843 0.459 42	2667 0.515 37	2506 0.573 33	2359 0.635 29
H01824	- 25.00	- 27 50	-2100	C1 C2	128	01 00	322	22.5	- 01 fb
10	ro	9.	9.	7.	~	7.	∞.	∞.	6.
=======================================	12.	13.	4	15.	16	17.	138	19.	20.
=	13	13	7	15	16	17	18	19	20
				10.62	1.193				
				77.15	1.245				-
				443.59	1.299				
				40.25	1.193				
				3½x11½					
				4x12					

(Table 20 Continued on Next Page.)

							Miles ar	-				
For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	Q	In.	0.656	0.688	0.719		0 281	0.313		
pages				2000			1, 1	1.25 0.95 1.04				
le see	Hection			1800				1.25				
his tab	num De	d		1600				1.25		11213 0.216 240 180		
on of t	Maxin For	ndicate		1500				1.25 0.95 1.04		10504 0.203 225 169		
lanati	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per	oquare Inch, as indicated		1400	3206 0.981 38			1.25	10917 0.153 260 175	9795 0.189 210		
ull exp	in Pour for Uni	quare L		1300	2961 0.911 35	2805. 1.000		1.25 0.95 1.04	10129 0.142 241 163	9087 0.176 195		
· For 1	Loads Inches,	/2		1200	2716 0.841 32	2572 0.923 29		1.25 0.95 1.04	9342 0.131 222 150	8378 0.162 180		
	al Safe	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1100	. 2471 0.771	2338 0.846 27	2216 0 925 24	1.25 0.95 1.04	8554 0.121 204 138	.7670 0.149 164		
				0001	2226 0.701 27	2104 0.769 24	1992 0.841 22	1 25 0 95 1 04	7766 0.110 185 125	6961 0.135 149		
	Refer-	Num- ber					H 63 69	67 65	20 60 mm	104	-0004	-004
	Ratio of Span	Depth of Surfaced Timber	1/h		21.9	23.0	24.0	Multiplying Factor	8.0	6.		
	3	Span	<i>a</i> 2¢		21	55	23	Multi	6	01		
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		10.62	1.193		12.46	1.185		
	Section Modu- lus	S	φ	In.3		77.15	1.245		106.31	1.229		
inued.	Moment of Inertia	Inertia	12	In.4	,	443.59	1.299		117.61	1.275		
20-Continued	Area Cross Section	Area Cross Section		Sq. In.		40.25	1.193		47.25	1.185		
	Size Surfaced Sisting or 84S		OF 040	In.		32x11½	-		31x133			
TABLE	7.	Rough		In.		4x12			4x14			

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	0.625
		10738 0 457 177 173	9948 0.530 152	9265 0.608 132	8661 0 692 116	8128 0 781 103	7654 0.876 91	7223 0.976 81	
11459 0.295 223 184	10479 0 350 187	9648 0.412 159	8936. 0.477 137	8320 0.547 119	7775 0.623 104	7294 0.703 92	6866 0.789 82	6477 0.879 73	6127 0.973 66
10170 0.262 198	9298 0.311 166	8558 0.366 141	7924 0 424 121	7375 0.486 105	6889 0.553	6460 0.625 81	6078 0.701 72	5731 0.781 65	5418 0.865 58
9526 0.245 186	8708 0.292 156	8013 0.343 132	7418 0.397 114	6902 0.456 99	6446 0.519 86	6043 0.586 76	5685 0.657 68	5358 0.732 60	5064 0.811 54
8882 0.229 173	8117 0.273 145	7468	6911 0.371 106	6429 0.426 92	6003 0.484 80	5626 0.547	5291 0.613 63	4985 0.684 56	4710 0.757 50
8238 0.213 161	7527 0.253 134	6923 0.297 114	6405 0.344 98	5957 0.395 85	5560 0.450 74	5209 0.508 66	4897 0.570 58	4612 0.635 52	4356 0.703 47
7593 0 196 148	6936 0.234 124	6378 0.274 105	5899 0.318 90	5484 0.365 78	5117 0.415 68	4792 0.469 60	4503 0.526 54	4239 0.586 48	4001 0.649 43
6949 0.180 135	6346 0.214 113	5833 0.251 96	5393 0.292 83	5012 0.334 72	4674 0.381 63	4375 0.430 55	4109 0.482 49	3866 0.537 44	3647 0.595 39
6305 0.164 123	5755 0.195 103	5288 0.228 87	4887 .0.265 75	4539 0.304 65	4231 0.346 57	3958 0.391 50	3715 0.438 44	3493 0.488 39	3293. 0.541
1004	-26	01 00 4	-0.00	1000	-2%	-0769	-00	222	01 m
8.6	10.7	11.6	12.4	13.3	14.2	15.1	16.0	16.9	17.8
11	12	13	14	15	16	17	18	19	20
	•			12.46	- 83				
				106.31	827.1				
				717.61	1.2/3				
				47.25	<u> </u>				
				3½x13½					
				4x14					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	Ω		0.656	0.688	0.719	0.750	0.781	0.813	
ages (2000							1.23 0.96 1.04
le see I	effection			1800				: :			1.23 0.96 1.04
ils tab	num Do	ਰ		1600	5136 0.954 52						1.23 0.96 1.04
n of th	Maxin s in Pot	ndicate		1500	4799 0.895 49	4558 0.981 44					1.23 0.96 1.04
lanatio	ds, and Stresse	ich, as i		1400	4462 0.835 46	4235 0.915 41					1.23 0.96 1.04
ıll exp	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresse in Pounds per	oquare Inch, as indicated		1300	4124 0.775 42	3913 0.850 38	3718 0.930 35				1.23 0.96 1.04
For fu	Loads i	Ž		1200	3787 0.716 39	3591 0.785 35	3410 0.858 32	3243 0.934 29			1.23 0 96 1 04
	al Safe			1100	3449 0.656 35	3269 0.719 32	3102 0.787 29	2948 0.857 26	2808 0.929 24		1.23 0.96 1.04
	Tota		4	1000	3112 0.596 32	2947 0.654 29	$\frac{2794}{0.715}$	2653 9.779 24	2524 0.844 22	2403 0.914 20	1.23
		Keter- ence Num- ber	Num- per		67 60	c) co	~0100		100	-03.60	H04
	Ratio of Span to	Depth of Surfaced Timber	1/h		18.7	19.6	20.4	21.3	22.2	23.1	lying
	5	nedo		F.	21	22	13	24	22	26	Multiplying Factor
	R HTE	Green Timber at 38	lbs. per cu. ft.)	Lbs.				12.46			
	Section Modu- lus	S	0	In.3				106.31			-
nned.	Moment of Inertia	hb3	77	In.4				717.61			
20—Continued	Area Cross Section	A=bh		Sq. In.				1.185		and deplaces	
LE 20	vize	Surfaced	OF 040	In.				32x132			
TABLE	7.	Rough		In.				4x14			

0.344	0 375	0.406	0.438	0.469	0 500	0.531	0.563	0.594	0.625
	:	: ' - :	13156 0 462 176 185	12245 0 530 153	11451 0 603 134	10755 0.681 119	10124 0 763 106	9566 0 850 94	9058 0 942 85
		12754 0 358 184 179	11820 0.416 158	10999 0.477 138	10283 0.543 121	9655 0.613 107	9086 0.687 95	\$582 0.765 85	8124 0.848 76
	12289 0 271 192 172	11316 0.318 163	10485 0 370 140	9753 0.424 122	9115 0.483 107	8555 0.545 94	8048 0.611 84	7598 0.680 75	7189 0 754 67
12590 0.214 214 176	11510 0 254 180	10598 0.299 153	9817 0.347 131	9130 0.398 114	8531 0 453 100	8006 0.511 88	7529 0.572 78	7107 0.637 70	6722 0.706 63
11740 0.200 200 164	10731 0 237 168	9879 0.279 143	9149 0.324 123	8507 0.371 106	7947 0.422 93	7456 0.477 82	7009 0.534 73	6615 0.595 65	6255 0.659 59
10890 0.185 186 153	9952 0 221 155	9160 0.259 132	8481 0.300 114	7884 0.345 99	7363 0.392 86	6906 0.443 76	6490 0.496 68	6123 0.552 60	5788 0.612 54
10041 0.171 171 141	9174 0.204 143	8441 0.239 122	7814 0.277 105	7261 0.318 91	6779 0.362 79	6356 0.409 70	5971 0.458 62	5631 0.510 56	5320 0.565 50
9191 0.157 157 129	8395 0 187 131	0.219 0.219 111	7146 0 254 96	6638 0.292 83	6195 0.332 73	5806 0.375 64	5452 0.420 57	5139 0.468 51	4853 0.518 45
8341 0.143 142 117	7616 0 170 119	7003 0.199 101	6478 0.231 87	6015 0.265 75	5611 0.302 66	5256 0.341 58	4933 0.382 51	4647 0.425 46	4386 0.471 41
12224	H01004	H 01 €0 44	-0.004	-000	-22	-25	-20	-0100	-0100
00 10	60	10.1	10.8	11.6	12.4	13.2	13.9	14.7	15.5
=	12	13	41	15	16	17	18	19	50
				14.31	28				
				140.15	717.1	-			
				1086.13	1.230				
					081.1				
				32x153					
				4x16					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	D	In.	0.656	0.688	0.719	0.750	0.781	0.813	0.844
pages	is in			2000							
le see	flection			1800	7709						
is tab	aum De	а		1600	6819 0.831 61	6483 0.912 55	6172 0.997 50				
on of th	Maxin S in Por	ndicate		1500	6374 0.779 57	6059 0.855 52	5766 0.935 47				
lanatio	nds, and	ich, as i		1400	5929 0.728 53	5634 0.798 48	5359 0 872 44	5108 0.950 40			
ull exp	Total Safe Loads in Pounds, and Maximum Deflections in Inchest for Init Stresses in Pounds per	quare inch, as indicated	9	1300	5484 0.676 49	5209. 0.741	4953 0.810 40	4718 0.882 37	4504 0.958 34		
For f	Loads Inches,	Inches, f		1200	5039 0.624 45	4784 0.684 41	4547 0.748 37	4329 0.814 34	4130 0.884 31	3942 0.956 28	
	al Safe		9	1100	4594 0.572 41	4359 0.627 37	4140 0.686 34	3939 0.746 31	3756 0.811 28	3583 0.876 26	3421 0 945 24
		Total		2001	4149 0.520 37	3934 0.570 34	3734 0.623 30	3550 0 679 28	3382 0.737 25	3223 0.796 23	3075 0.859 21
		Num- ber			-0700	- 87 89	-00	H 67 65	-0160	-00	~ 67 65 —
	Ratio of Span to	Ratio of Span to Depth of Surfaced Timber			16.3	17.0	8 21	18.6	19.4	20.1	50 8
	ŭ	nedo		E.	21	22	23	24	255	26	27
	B 118	Green Timber at 38	cu. ft.)	Lbs.			14.31	1.180			
	Section Modu- lus	S-bh2	0	In 3			140.15	1.217			
inued.	Moment of Inertia	I bh³	14	ln.4			1086 13	1.256			
20-Continued.	Area Cross Section	A=bh		Sq. In.			54.25	1.180			
	Size	Surfaced SISIE	OF CAR	In.			32x151				
TABLE	SI ₂	Rough		In.			4x16		-		

0.875		0.375	0.406	0,438	0.469	0.500	0.531	0.563	0.594
	1.22					14635 0.534 152 182	13745 0.603 135	12949 0.676 120	12239 0.753 107
	1.22 0 97 1.03				14059 0.423 156 175	13146 0.481 137	12343 0.543 121	11625 0.609 108	10984 0.678 96
	1.22 0.97 1.03		14457 0.282 185 185	13398 0.327 160	12470 0.376 139	11656 0.427 121	10941 0.482 107	10301 0.541 95	9730 0.603 85
	1 22 0.97 1.03	14701 0.225 204 182	13541 0.265 174	12547 0.307 149	11676 0.352 130	10912 0.401 114	10240 0.452 100	9639 0.507 89	9103
	1.22 0.97 1.03	13708 0.210 190 170	12624 0.247 162	11695 0.287 139	10881 0.329 121	10167 0.374 106	9539 0.422 94	8977 0.473 83	8475 0.527 74
	1 22 0 97 1.03	12715 0.195 177 158	11707 0.229 150	10844 0.266 129	10087 0.305 112	9422 0.347 98	8838 0.392 87	8315 0.440 77	7848 0.490 69
	1.22 0.97 1.03	11722 0.180 163 146	10790 0.212 138	9992 0.246 119	9292 0.282 103	8677 0.321 90	8137 0.362 80	7653	7221 0.452 63
	1.22 0.97 1.03	10729 0.165 149 134	9874 0.194 127	9141 0.225 109	8498 0.258 94	7933 0.294 83	7436 0.332 73	6991 0.372 65	6593 0.414 58
2938 0.923	1 22 0.97 1.03	9736 0.150 135 122	8957 0.176 115	8289 0.205 99	7703 0.235 86	7188 0.267 75	6735 0.301 66	6329 0.338 59	5966 0.377 52
	-04	-01 to 4	# 61 to 41		40004	# 02 to 4	-00	67 69	63 65
21.7	Multiplying Factor	00	8	9.6	10.3	11.0	11.7	12.3	13.0
28	Multi	12	13	14	70	16	17	. 18	19
		:			16.16				
					178.65				
		1			1563.15				
					1.175				
					32x172				
					4x18				

(Table 20 Continued on Next Page.)

									~	
Deflec- tion equiv- alent	to 1/32 lnch per Foot of Span	D	1	0.625	0.656	0.688	0.719	0.750	0.781	0.813
			2000		11015 0.920 87					
flection			1800	10405 0.751 87	9880 0.828 78	9398 0.909 71	8952 0 994 65		. :	
num De	7		1600	9213 0.668 77	8744 0.736 69	\$314 0.808 63				·
Maxin s in Pou	ndicate		1500			7773 0.758 59	7398 0.829 54		6750 0.979 45	: : .
ids, and	nch, as i		1400			7231 0.708 55	6880 0.773 50	6566 0.841 46		5998 0.987
in Poun	quare Ir	-	1300			6689 0 657 51	6362 0.718 46			5539 0.917 36
Loads i	<u>,</u> ∞	-	1200	6829 0.501 57	6473 0.552 51	6117 0.606 47				5081 0.846 33
al Safe			1100		5906 0 506 47	5605 0.556 42	5326 0.608 39			4622 0.775 30
Tota				5637 0 417 47	5338 0.460 42	5063 0 505 38	4808 0.552 35			4164 0.705 27
Refer	ence Num- ber				1000	-000	01 cc	351	-00	- 01 to
Ratio of Span to	Depth of Surfaced Timber	4/h		13.7	14 4	15.1	15 8	5 91	17.1	17.8
			Ft	50	21	22	233	24	25	56
Weight per Lineal Foot (Based	On Green Timber at 38	cu. ft.)	Lbs.				16.16			
Section Modu- lus	bh²	5	ln.3				178.65			
Moment of Inertia	I=19	77	In.							
Area Cross Section	A=bh		Sq In.							
26	Surfaced S1S1E or S4S		In.							
52	Rough		In.							
	Moment Section Per Ratio of Modu- Lineal of Foot Span (Based to 1880) Total Sate Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per 18efer- 1880 Refer- Refer- Refer- Refer- 1880 Refer- Refer- Refer- 1880 Refer- Refer- 1880 Refer- Refer- 1880 Refer- Refer- 1880 Refer-	Zection Inertia Rection Per Or Section Inertia Cross C	Chest Ches	Cross Moment Section Per Section Per Section Per Section Per Section Per Surfaced Surfaced	Area Moment Section Weight Ratio Cross Cross Modu-Lineal Span Span Span Depth Section Span Depth Surfaced Surfa	Check	Size Cross Offices Cross Offices Cross C	Section Inertia Modu- Linear Section Part Section Linear Span Span Depth ence Surfaced Surfaced	Size Cross Area Moment Section Per Pool Span Depth Surfaced Span Depth Size Cross Section Inertia Inerti	Size Cross Cross

0.84	0.875	906.0	0 938		0.125	0.156	0.188	0.219	0.250	
	1.:	: . :		1 21 0 97 1 03		7360 0 166 491 183	6118 0 239 340	5228 0.326 249	4558 0.425 190	
:				1 21 0 97 1 03	: : :	6620 0.149 441 165	5501 0.215 306	4700 0.293 224	4096 0.383 171	
			: : :	1 21 0 97 1.03	7365 0.0850 614 183	5880 0.133 392	4885 0.191 271	4171 0 261 199	3634 0.340 151	
	:	: :	: . !	1.21 0.97 1.03	3903 797 575 172	5510 0.125 367	4577 0.179 254	3907 0.244 186	3403 0.319 142	
33.9			i :	1 21 0.97 1.03	6440 0.0744 536 160	5140 0.116 343	4268 0.167 237	3643 0 228 174	3171 0.298 132	
5301 0.989 33				1 21 0 97 1.03	5978 0.0691 498 146	4770 0.108 318	3960 0.155 220	3379 0.212 161	2940 0.276 122	
4860 ₁	4658 0.982 28			1.21 0 97 1.03	5516 .0638 460 137	4400 0.0996 293	3652 0.144 203	3114 0.195 148	2709 0.255 113	
4418 0.837 27	4232 0.900 25	4052 0.965 23		1.21 0.97 1.03	4591 5053 .0532 0.0585 0 383 421 115 126	4030 0.0913 268	3343 0 132 186	2850 0.179 136	2478 0.234 103	ext Pa
3977 0.761 25	3806 0 818 23	3641	3488 0 939 19	1 21 0.97 1.03	4591 0.0532 383 115	3660	3035 0.120 169	2586 0.163 123	2247 0.213 94	l on N
— 01 to	~ 01 cc	- 27 53	-0100	H 27 4	40004	01 00 4	-25			20 Continued on Next Page)
18 5	19.2	19 9	20 6	Multiplying Factor	8.7	10.9	13.1	15.3	17.5	
72	\$1	29	30	Multi	7	ro	9	t~		(Tuble
		16.16]]	7 980	1.190			
		178.65				97 73	1.298			
		1.244				76 96			_	_
		61.25				30 95				-
		3½x17½				eri M H M	03V03			_
		4x18				g	OVO			

TABLE 20-Continued.

***					_					
For full explanation of this table see pages 68 to 70.	Deflec- tion equivalent	to 1/32 Inch per Foot of Span	D	In.	0.281	0.313	0 344		0.156	0 188
) səzml				2000	4036 0.539 149	3618 0 664 121	3274 0.804	1.30 0.92 1.09		
le see	flection			1800	3625 0.485 134	3248 0 597 108	2938 0.723 89	1.30 0.92 1.09		
nis tab	num De	T		1600	3214 0.431 119	2878 0 531 96	2602 0.643 79	1.30		9097 0.140 379 167
on of th	Maxin s in Pou	ndicate		1500	3009 0.404 111	2694 0.498 90	2434 0.603 74	1.30		8524 0.131 355 156
Janatí	ids, and	ich, as i		1400	2804 0.377 104	2509 0.465 84	2265 0.563 69	1.30	9567 9567 478 175	7951 0.123 331
'ull exp	in Pour	Total Safe Loads in Pounds, and Maximum Deflectious in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1300	2598 0.350 96	2324 0 432 77	2097 0 522 64	1.30 0.92 1.09	8192 8880 9 .0730 0.0791 0.0 4441 150 162	7379 0.1114 307
For f	Loads Inches,			1200	2393 0 323 89	2139 0 398 71	1929 0.482 58	1.30	8192 0.0730 409 150	6806 0 105 284
	al Safe			1100	2187 0 296 81	1954 0.365 65	1761 0 442 53	1.30 0.92 1.09	7505 .0669 375 137	6234 9963 260
					1982 0 269 73	1769 0 332 59	1593 0.402 48	1.30	6818 0.0608 341 125	5661 0876 236
	Refer-		Num- ber		-0100		H 0100	104	1004	1284
	Ratio of Span to	Depth of Surfaced Timber	Surfaced Timber U/h		19 6	21.8	24 0	Multiplying Factor	8.0	9 6
		Span		Ft.	6	10	=	Multi	ro	~
	Weight per Lineal Foot (Based	Green Timber at 38	cu. ft.)	Lbs.		7 9×0	0.00		1.164	
	Section Modu- lus	S	0	In.3		27.73	087		51 56	
inued.	Moment of Inertia	Area Moment Cross of Section Inertia A=bh I=		1111		76 26			193 36	,
-Cont	Area Cross Section			Sq. Jn.	_	30.25			41.25	
LABLE 20-Continued	Surfaced SISIE or S4S			Jin.	***************************************	52x51			52x72	
LAB	G.	Size Surface Rough S1S1		ln.		6x6			6x8	

219	250	281	313	344	375	0.406	0.438	0.469	
0	0	0	0.	0.	0.	0	0	0	İ
9744 0.238 348 178	8505 0.311 266	7540 0 394 209	6761 0.486 169	6124 0 589 139	5595 0.701 117	5143 0 822 99	4754 0.954 85	: : :	1.24 0.94 1.06
8762 0.215 313 161	7646 0.280 239	6776 0 355 188	6074 0.438 152	5500 0.530 125	5022 0.631 105	4615 0.740 89	4263 0.858 76	3961 0 986 66	1.24 0.94 1.06
7780 0.191 278	6787 0 249 212	6012 0.316 167	5387 0.389 135	4875 0.471 111	4450 0.561 93	4086 0.658 79	3773 0 763 67	3503 0.876 58	1.24 0.94 1.06
7289 0.179 260	6357 0 234 199	5631 0.296 156	5044 0.365 126	4563 0.442 104	4164 0.526 87	3822 0.617 73	3528 0.716 63	3274 0.822 55	1.24 0 94 1 06
6798 0.167 243	5927 0 218 185	5249 0 276 146	4700 0.340 117	4251 0.412 97	3877 0.490 81	3558 0.576 68	3282 0.668 59	3044 0.767 51	1.24 0.94 1.06
6307 0.155 225	5498 0.202 172	4867 0.256 135	4357 0.316 109	3939 0.383 90	3591 0.455 75	3294 0.534 63	3037 0.620 54	2815 0.712 47	1.24 0.94 1.06
5816 0.143 208	5068 0.187 158	4485 0.237 125	4013 0.292 100	3626 0.353 82	3305 0.420 69	3029 0.493 58	2792 0.572 50	2586 0.657 43	1.24 0.94 1.06
5325 0.131 190	4639 0.171 145	4103 0.217 114	3670 0.267 92	3314 0.324 75	3018 0.385 63	2765 0.452 53	2546 0.525 45	2357 0.602 39	1.24 0.94 1.06
4834 0.119 173	4209 0.156 131	3721 0.197 103	3326 0 243 83	3002 0.294 68	2732 0.350 57	2501 0.411 48	2301 0.477 41	2128 0.548 35	1.24 0.94 1.06
H 2 2 2 4	-228	-0160	# 27 ED	67 69	3 2 3	- 07 00	~ c1 co	-0.00	H 24 4
. 67	12.8	14.4	16.0	17.6	19.2	20.8	22.4	24.0	lying
7	00		10	=======================================	12	13	14	15	Multiplying Factor
	***************************************	.,		10.88					
-				10.					
				51.56					
				193.36					
				1.164					
				5½x7½					
				6x8					

(Table 20 Continued on Next Page.)

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Deflection equivalent to 1/32	Inch per Foot of Span	Q	In.	0.219	0.250	0.281	0.313	0.344	0.375
		0000	7000			12126 0.312 270 176	10890 0.385 218	9872 0.465 180	9023 0.554 150
flection		0001	0061		12297 0.222 307 178	10901 0.281 242	9787 0.346 196	8870 0.419 161	8104 0.499 135
num De		900	0001	12511 0.151 357 181	10919 0.197 273	9676 0.249 215	8684 0.308 174	7867 0.372 143	7185 0.443 120
Maxim s in Pou		00	0007	11723 0.141 335 170	10230 0.185 256	9064	8133 0.289 163	7366 0.349 134	6726 0.415 112
Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Sourae Inch, as indicated		907	1400	10935 0.132 312 159	9540 0.172 238	8451 0.218 188	7582 0.269 152	6865 0.326 125	6267 0.388 104
n Pound or Unit		000	oner	10147 0.123 290 147	8851 0.160 221	7839 0.203 174	7030 0.250 141	6364 0.302 116	5807 0.360 97
Loads in nches, f		1900	0051	9359 0.113 267 136	8162 0.148 204	7226 0.187 161	6479 0.231 130	5862 0.279 107	5348 0.332 89
Safe		100	OOTÍ	8571 0.104 245 125	7472 0.135 187	6614 0.171 147	5927 0.212 119	5361 0.256 97	4888 0.305 82
Tota		0001	2001	7783 0.0942 222 113	6783 0.123 170	6001 0.156 133	5376 0.192 108	4860 0.233 88	4429 0.277 74
Refer-	Num- ber			1004	H01004	— c1 co ↔	-0.6	-026	-0100
Ratio of Span to	of of Surfaced Timber	<i>1</i> /Ъ		oc oc	10.1	11.4	12.6	13.9	15.2
Š	Span		H.	1-	00	6	10	T .	12
Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			13.79			
Section Modu- lus	bh²	9	In.3			82.73			
Moment of Inertia	Pp3	12	In.4			392 96	-		
Area Cross Section	A==bh		Sq. In.	taken data		52.25	_	_	
4)ZF	Surfaced S1S1E	or S4S	In.	A.		5½x9½			
Î	Rough		la.			6x10			

0.406	0.438	0.469	500	.531	.563	.594		.250	. 281	
			0	0	0	0		0	.0	
8303 0.650 128	7685 0 754 110	7147 0.866 95	6673 0.985 83				1.21 0.95 1.05			
7455 0.585 115	6897 0.678 99	6412 0.779 85	5984 0 886 75				1.21 0.95 1.05			
6607 0 520 102	6109 0.603 87	5676 0 693 76	5294 0 788 66	4953 0.890 58	4651 0.997 52		1 21 0.95 1.05		14218 0.206 263 170	
6183 0.487 95	5716 0.565 82	5309 0.649 71	4950 0 738 62	4629 0.834 54	4345 0.935 48	: : :	1.21 0.95 1.05	15032 0.153 313 180	13320 0.193 246	
5758 0.455 89	5322 0.528 76	4941 0.606 66	4605 0.689 58	4305 0.778 51	4039 0 873 45	3801 0.972 40	1.21 0.95 1.05	14021 0.142 292 168	12422 0.180 230	
5334 0 422 82	4928 0.490 70	4573 0.563 61	4260 0.640 53	3981 0.723 47	3733 0.810 41	3511 0.902 37	1.21 0.95 1.05	13010 0.132 271 156	11524 0.167 213	
4910 0.390 76	4534 0.452 65	4205 0.519 56	3915 0.591 49	3656 0.667 43	3426 0.748 38	3220 0.833 34	1 21 0.95 1.05	11999 0.122 250 144	10626 0.155 197	(e.)
4486 0 357 69	4140 0.415 59	3838 0.476 51	3571 0.542 45	3332 0.612 39	3120 0.686 35	2930 0.764 31	1.21 0.95 1.05	10988 0.112 229 132	9728 0.142 180	xt Pag
4062 0.325 63	3746 0 377 54	3470 0.433 46	3226 0.492 40	3008 0.556 35	2814 0.623 31	2640 0.694	1.21 0.95 1.05	9977 0.102 208 120	8830 0.129 164	on Ne
-0100	01 00	-0100	-2100	-0100	H 01 00	H 67 89	-04	-01024	-004	inued
16.4	17.7	19 0	20.3	21.5	22.7	24 0	Multiplying Factor	 	9.4	(Table 20 Continued on Next Page.
13	14	15	16	17	18	19	Mult	00	6	(Table
			13.79	1.148				16.69	1.138	1
			82.73	1.209				121.23	1.188	
			392.96	1.273				697.07	1.240	
			52.25	1.148				63.25	1.138	
			5½x93					5½x11½		
			6x10					6x12		

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Deflection cquivalent to 1/32	Foot of Span	D	In.	0.313	0.344	0.375	0.406	0.438	0,469	0.500
		0000	2002		14512 0.384 220 174	13276 0.458 184	12221 0.537 159	11312 0.623 135	10528 0.715 117	9837 0.813 102
lections		1000	1900	14381 0.286 240 173	13042 0.346 198	11908 0.412 166	10977 0.483 141	10157 0.561 121	9450 0.643 105	8827 0.732 92
um Del nds per l		000	1000	12764 0.254 213	11573 0.307 175	10581 0.366 147	9733 0.430 125	9003 0.498 107	8372 0.572 93	7816 0.650 81
Maximi in Pou		00	0001	11956 0.238 199	10838 0.288 164	9907 0.343 138	9112 0.403 117	8426 0.467 100	7834 0.536 87	7311 0.610 76
s, and Stresses cb, as in			1400	111148 0.222 186	10103 0.269 153	9233 0.320 128	8490 0.376 109	7848 0.436 93	7295 0.500 81	6806 0.569 71
in Pounds, and Maxim for Unit Stresses in Pou Square Inch, as indicated		1900	noer	10340 0 207 172	9368 0.250 142	8559 0.297 119	7868 0.349 101	7271 0.405 87	6756 0.465 75	6301 0.528 66
Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		000	17071	9531 0.191 159	8634 0.231 131	7886 0.275 1111	7246 0.322 93	6694 0.374 80	6217 0.429 69	5795 0.488 60
Safe I		1100	POIT	8723 0.175 145	7899 0.211 120	7212 0.252 100	6624 0.295 85	6116 0.343 73	5678 0.393 63	5290 0.447 55
Total		1000	2001	7915 0.159 132	7164 0.192 109	6538 0.229 91	6002 0.268 77	5539 0.312 66	5139 0.358 57	4785 0.407 50
Refer-	Num- per				₩ C1 55 4	 0100	-0100	-0.00	~6765	700
Ratio of Span to Deeth		ч/2		10.4	11.5	19.5	13.6	14.6	15.7	16.7
Span	,		Ft.	10	11	12	13	14	15	16
Weight per Lineal Foot (Based on	Green Timber at 38	lbs. per cu. ft.)	Lbs.			16.69	1.138			
 Section Modu- lus	bh2	9	In.3			121.23	1.188			_
Moment of Inertia	bh3	12	ln.4			70.769	1.240			
Area Cross Section	A==bh		Sq. In.			63.25	1.138		_	
Size	Surfaced S1S1E	or S4S	In.			52x113				
52	Rough		In.		2.200	6x12				

											,
0.531	0.563	0.594	0.625	0.656	0.688	0.719		0.281	0.313	0.344	
9224 0.918 90				: 0 :			1.19				
8273 0.826 81	7784 0.927						1.19			18000 0.295 234 184	
7322 0.734 72	6886 0.824 64	6489 0.917 57					0.95		17628 0.216 252 180	15976 0.262 208	
6847 0.688 67	6437 0.773 60	6064 0.860 53	5728 0.953 48				1.19		16514 0.203 236 169	14964 0.245 194	
6372 0.643 62	5987 0.721 55	5639 0.802 49	5323 0.889 44	5040 0.981 40			1.19 0.95 1.04	17142 0.153 272 175	15400 0.189 220	13952 0.229 181	
5896 0.597 58	5538 0.670 51	5213 0.745 46	4919 0.826 41	4655 0.911 37	4409 1.000 33		0.95	15905 0.142 253 163	14286 0.176 204	12940 0.213 168	
5421 0.551 53	5089 0.618 47	4788 0.688 42	4515 0.762 38	4270 0.841 34	4042 0.923 31		1.19 0.95 1.04	14668 0.131 233 150	13172 0.162 188	11928 0.196 155	1
4945) 0.505 48	4640 0.566 43	4362 0.631 38	4111 0.699 34	3885 0.771 31	3674 0 846 28	3481 0.925 25	1.19 0.95 1.04	13431 0.121 213 138	12058 0.149 172	10916 0.180 142	71
4470 0.459 44	4191 0.515 39	3937 0.573 35	3707 0.635 31	3500 0.701 28	3307 0.769 25	3130 0.841 23	1.19 0.95 1.04	12194 0.110 194 125	10944 0.135 156	9904	17
-0100	→6 3 m	- 62 65	-0.00	-0.00	25	H 63 00	014	101004	-0°		A. S
17.7	18.8	19.8	20.9	21.9	23.0	24.0	Multiplying Factor	8.0	8.0	8.0	The state of the s
17	18	19	20	21	87	23	Multi	0.	10	11	/m-1-1
			16.69	1.138					19.60		
			121.23	- 188					167.06		
			20.769	1.240					1127.67		
			63.25	1.138					74.25		
			5½x11½						5½x13½		
			6x12						6x14		

(Table 20 Continued on Next Page.)

.0 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	Jn.	0.375	0.406	0 438	0.469	0.500	0.531	0.563
68 t	D 2 8 8 3	III S.	1		1						
ages	s in			2000		16875 0.457 186 173		14550 0.608 139	13606 0.692 121	12769 0.781 107	12017 0.876 95
For full explanation of this table see pages 68 to 70.	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Cirif Stresses in Pounds per			1800	16469 0.350 196	15162 0.412 167	14045 0.477 143	13066 0.547 124	12214 0.623 109	11459 0.703 95	10780 0.789 86
is tab	num Def	rt		1600	14613 0.311 174	13449 0, 366 148	12454 0.424 127	11581 0.486 110	10822 0.553 97	10149 0.625 85	9543 0 701 76
n of th	Maxim s in Pou	noncare		1500	13685 0.292 163	12593 0.343 138	11659 0.397 119	10839 0 456 103	10126 0.519 90	9494 0 586 80	8925 0 657 71
anatio	ds, and Stresse	ECH, 283 1		1400	12757 0.273 152	11736 0.320 129	10863 0 371 111	10097 0.426 96	9430 0.484 84	8838 0.547 74	8306 0 613 66
ill exp]	Loads in Pounds, and Maximum Inches, for Unit Stresses in Pounds	mare m		1300	11829 0 253 141	10880 0.297 120	10068 0 344 103	9355 0.395 89	8734 0.450 78	8183 0.508 69	7688 0 570 61
For fu	Loads i	ž		1200	10901 0.234 130	10023 0.274 110	9272 0 318 95	8612 0 365 82	8038 0.415	7528 0.469 63	7069 0 526 56
	I Safe			0011	9973 0.214 119	9167 0.251 101	8477 0 292 87	7870 0.334 75	7342 0.381 65	6873 0.430 58	0 482 51
i	Tota			0001	9045 0.195 108	8310 0.228 91	7681 0 265 78	7128 0.304 68	6646 0.346 59	6218 0.391 52	5832 0 438 46
	Refer-	Num- ber			-000	-0004	-0100	-250	-0100	-0100	200
	Ratio of Span to	of of Surfaced Timber	1/h		10.7	11.6	12.4	55 55	14.2	15.1	16 0
		nado		Ft.	12	13	41	10	16	17	3x
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			19 60	1 131			_
	Section Modu- lus	S-bh2	9	In.8			167 06	1 173			-
nued.	Moment of Inertia	bh³	12	In.4	_	_	1127 67	1 216			
-Continued	Area Cross Section	A=bh		Sq. ln.			74.25	31			
LE 20	-Si Ze	Surfaced	or S4S	In.	,		53x133				
TABLE	·7.	Rough		In.			6x14				

0.594	0.625	0 656	0.688	0 719	0.750	0.781	0.813		0.344	0.375	
11348 0.976 85							: : :	1.17			
10176 0.879 77	9631 0.973 69							1.17			
9004 0.781 68	8517 0.865 61	8071 0.954 55						1.17 0.96 1.04		19314 0.271 201 172	
8418 0.732 63	7960 0.811 57	7541 0.895 51	7161 0.981 46					1.17 0.96 1.04	19778 0.214 225 176	18090 0.254 188	
7832 0.684 59	7403 0.757 53	7011 0.835 48	6654 0.915 43				: : :	1.17	18443 0.200 210 164	16866 0.237 176	
7246 0.635 54	6846 0.703 49	6481 0.775 44	6148 0.850 40	5844 0.930 36				1.17 0.96 1.04	17108 0.185 195 153	15642 0.221 163	
6660 0.586 50	6290 0.649 45	5950 0.716 40	5642 0.785 37	5359 0.858 33	5098 0.934 30			1.17 0.96 1.04	15773 0.171 179 141	14418 0.204 150	ge.)
6074 0.537 46	5733 0.595 41	5420 0.656 37	5136 0.719 33	4875 0.787 30	4634 0.857 28	4412 0.929 25		1.17 0.96 1.04	14438 0.157 164 129	13194 0.187 137	ext Pa
5488 0.488 41	5176 0.541 37	4890 0.596 33	4630 0.654 30	4391 0.715 27	4170 0.779 25	3966 0.844 23	3773 0.914 21	1.17 0.96 1.04	13103 0.143 149 117	11970 0.170 125	on N
-0100	₩ 63 m	- 04 50	-0100	01 co		~0100	-0100	H014	102004	H 62 65 44	tinued
16.9	17.8	18.7	19.6	20.4	21.3	22.2	23.1	Multiplying Factor	00 FG	9.3	(Table 20 Continued on Next Page.
19	20	21	55	53	24	25	26	Multi	11	12	(Table
		1 60		19.60					22.50	1.126	
				167.06					220.23	1.162	
-				1127.67					1706.78	1.200	
		_		74.25					85.25	1.126	
				5½x13½					53x153		
				6x14					6x16		

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For full explanation of this table see pages 68 to 70.	Deffection equivalent to 1/32	Inch 'per Foot of Span	Q	ln.	0 406	0 438	0.469	0.500	0.531	0.563
sazes (2000		20665 0.462 184 185	19253 0 530 160	18000 0.603 141	16898 0.681 124	15915 0.763 110
le see 1	flection			1800	20047 0.358 193 179	18567 20665 0 416 0.462 (184	17294 0.477 144	16164 0.543 126	15170 0.613 112	14283 0.687 99
nis tab	num De	o o		1600	17787 0.318 171	15420 -16469 0.347 0.370 138 147	15335 0.424 128	14328 0.483 112	13442 0 545 99	12 6 51 0.611 88
on of th	Maxin s in Pou	indicate		1500	16657 0.299 160		14356 0.398 120	13410 0.453 105	12578 0.511 93	11835 0.572 82
lanatio	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stressen in Pounds per	rquare then, as indicated		1400	15527 0.279 149	14371 0.324 128	13376 0.371 111	12492 0.422 98	11714 0.477 86	11019 0.534 76
ull exp	in Poun	daare T		1300	14397 0.259 138	13322 0.300 119	12397 0.345 103	11574 0.392 90	10850 0.443 80	10203 0.496 71
For fi	Loads i	C.		1200	13267 0 239 128	12273 0.277 110	11417 0.318 95	10656 0.362 83	9986 0 409 73	9387
	al Safe			1100	12137 0.219 117	11224 0.254 100	10438 0.292 87	9738 0.332 76	9122 0.375 67	8571 0.420 59
	Tota			1000	11007 0.199 106	10175 0.231 91	9458 0.265 79	8820 0.302 69	8258 0 341 61	7755 0.382 54
	F	Keter- ence Num- ber			-01004	H 0100 A	₩ 67 60	-0166	100	- 63 69
	Ratio of Span to	of of Surfaced Timber	1/b		10.1	10.8	11.6	12.4	13 2	13.9
	5	nadr.		Ff.	133	#	15	16	17	<u>∞</u>
	Weight per Lineal Foot (Based	Green Timber at 38	lbs, per cu. ft.)	Lbs.			1 126			
	Section Modu- lus	bh²	9	In.?			1.162			
nued.	Moment of Inertia	bh³	12	In.4			1706.78	- v		
20-Continued	Area Cross Section	A=bh		Sq. In.		·	1.126			
	Size	Surfaced	or 248	Jh.		Second Col. Springer, Street,	5½x15½			
TABLE	Ø.	Rough		In.			6x16			

										1
0.594	0.625	0 656	0.688	0 719	0.750	0.781	0.813	0.844	0.875	
15043 0.850 99	14234 0.942 89	:::	: : :	:::		: ! !				1.16 0.97 1.03
13496 0.765 89	12766 0.848 80	12124 0.935 72			: : :					1.16 0.97 1.03
11949 0.680 79	11297 0 754 71	10725 0.831 64	10191 0.912 58	9704 0 997 53						1.16
11176 0.637 74	10563 0.706 66	10025 0.779 60	9524 0.855 54	9065 0.935 49						1 16 0.97 1 03
10402 0 595 68	9829 0.659 61	9325 0.728 55	8856 0 798 50	8426 0.872 46	8028 0.950 42					1.16 0.97 1.03
9629 0.552 63	9095 0.612 57	8625 0.676 51	8188 0.711 46	7787 0.810 42	7416 0.882 39	7079 0.958 35				1.16
8855 0.510 58	8360 0 565 52	7926 0.624 47	7520 0.684 43	7149 0.748 39	6804 0.814 35	6492 0.884 32	6194 0.956 30			1 16 0.97 1 03
\$082 0.468 53	7626 0.518 48	7226 0.572 43	6852 0.627 39	6510 0.686 35	6192 0.746 32	5904 0.811 30	5629 0.876 27	5377 0.945 25		1.16 0.97 1.03
7308	6892 0.471 43	6526 0.520 39	6184 0.570 35	5871 0.623 32	5580 0.679 29	5316 0.737 27	5064 0.796 24	4833 0.859 22	4615 0.923 21	1.16 0.97 1.03
H €1 55	-26	35	-000	-00	67 65	- 27 85	m 67 69	-0.00	02 03	104
14.7	15.5	16.3	17.0	17.8	18.6	19.4	20.1	20.9	21.7	Multiplying Factor
19	20	21	55	23	24	25	26	27	28	Multi
					1.126					
					1.162					
					1706.78					
			-							
					1.126					
					52x153					
					6x16					

(Table 20 Continued on Next Page.)

68 to 70.	Deflection tion equiv.	Inch per Foot of Span	D	In.	0.375	0.406	0.438	0.469	0.500	0.531
pages	n si			2000					22993 0.534 160 182	21588 0 603 141
le see	Atea Monent Section Per Per Of Per Per Of Per Per Of Per P			1800				22065 0.423 164 175	20653 0.481 143	19386 0.543 127
his tab	num Do	-		1600		22694 0.282 194 180	21025 0.327 167	19571. 0.376 145	18313 0.427 127	17184 0 482 112
on of tl	Maxin Por	ndicate		1500	23080 0.225 214 182	21255 0.265 182	19689 0.307 156	18324 0.352 136	17143 0.401 119	16083 0.452 105
lanatio	ds, and	ach, as i		1400	21521 0.210 199 170	19816 0 247 169	18353 0.287 146	17077 0.329 126	15973 0.374 111	14982 0.422 98
ull exp	in Pour	quare Ir		1300	19962 0.195 185 158	18377 0.229 157	17017 0.266 135	15830 0.305 117	14803 0.347 103	13881 0.392 91
For f	Loads Inches, 1	ž.		1200	18403 0.180 170 146	16938 0.212 145	15681 0.246 125	14583 0.282 108	13633 0 321 95	12780 0.362 84
	al Safe			1100	16844 0.165 156 134	15499 0 194 132	14345 0.225 114	13336 0.258 99	12463 0 294 87	11679 0.332 76
	Tot			1000	15285 0.150 141 122	14060 0.176 120	13009 0.205 103	12089 0.235 90	11293 0.267 78	10578 0.301 69
	Refer-	Num- ber			H01604		-000	-004	-2004	-10100
	Ratio of Span to	Depth of Surfaced Timber	1/h		62.	8	9.6	10.3	11 0	11.7
		Span		Ft.	12	<u> </u>	14	15.	16	17
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			25 40	1.122	_	
		S bh2	9	In.3		-	280 73	100		
inued.	Moment of Inertia	bh3	77	In.4	Political System Schools		2456 38	1.188		-
-Continued	Area Cross Section	A=bh		Sq. In.				1.122		
LE 20-	ize	Surfaced	CIFC IO	In.	-		52x172			
TABLE	2	Rough		In.		-	6x18			_

0.563	0.594	0.625	929 0	0.688	0 719	0 750	0.781	0.813	0.844	0 875	
20343 0.676 126	19211 0.753 112	18206 0 834 101	17287 0 920 91	: : :	: :						
18263 0 609 113	17242 0.678 101	16335 0.751 91	15505 0 828 82	14750 0 909 75	14063 0.994 68		: : :				
16183 0.541 100	15272 0.603 .89	14463 0.668 80	13723 0.736 73	13949 0 808 66	12435 0 884 60	11868 0 961 55				: :	
15143 0.507 93	14288 0.565 84	13528 0 626 75	12832 0 690 68	12199 0.758 62	11622 0 829 56	11089 0 901 51	10591 0 979 47				
14103 0 473 87	13303 0 527 78	12592 0.584 70	11941 0 644 63	11348 0 708 57	10808 0 773 52	10309 0.841 48	9843 0.914 44	9419 0.987 40		: :	
13063 0 440 81	12318 0 490 72	11656 0 543 65	11050 0.598 59	10498 0.657 53	9994 0 718 48	9529 0.781 44	9094 0.848 40	8699 0.917 37	8323 0.989 34		
12023 0 406 74	11333 0.452 66	10720 0.501 60	10159 0 552 54	9647 0.606 49	9180 0 663 44	8749 0.721 40	8346 0.783 37	7979 0.846 34	7630 0.913 31	7307 0.982 29	ye.)
10983 0.372 68	10349 0.414 60	9785 0.459 54	9268 0.506 49	8797 0.556 44	8367 0 608 40	7969 0.661 37	7597 0.718 34	7259 0.775 31	6937 0.837 29	6639 0.900 26	xt Pag
9943 0.338 61	9364 0 377 55	8849 0 417 49	8377 0.460 44	7946 0 505 40	7553 0.552 36	7189 0.601 33	6849 0.652 30	6539 0.705 28	6244 0.761 26	5971 0.818 24	on Ne
- 27 25	-000	01:00	01 00	-00		-0.00	357	327	07 65	H 63 60	tinued
51 55	13.0	13.7	14 4	15 1	15.8	16.5	17.1	17.8	18.5	19.2	Table 20 Continued on Next Page.
15	19	30	51	81	87	24	100	36	25	80	(Table
					1 122						
				_	1.155				-		
	_		-					_			
					1 182						
					1.122						
					52x173						
					6x18				-		

123

TABLE 20-Continued.

TABLE		20-Continued.	inned.								For f	ull exp	lanatic	on of th	his tab	ole see	pages	For full explanation of this table see pages 68 to 70.
03	Size	Area Cross Section	Moment of Inertia	Section Modu- lus	Weight per Lineal Foot (Based		Ratio of Span to	Refer-	Tota	I Safe 1	Loads in	n Poun	Loads in Pounds, and Maximum De- Inches, for Unit Stresses in Pounds per	Maxim s in Pou	num De	Total Safe Loads in Pounds, and Maximum Deflections in Inches. for Unit Stresses in Pounds per	ns in	Deflec- tion equiv- alent
Rough	Surfaced	A=bb	I—I	S bh2	Green Timber at 38	Span	021	Num- ber			<i>7.</i>	quare J	Square Inch, as indicated	indicate	Ţ			Inch per Foot of Span
	OF 10%3		21	9	lbs. per cu. ft.)		1/b											D
In	In.	Sq. In.	In.4	In.3	Lbs.	Ft.			1000	1100	1200	1300	1400	1500	1600	1800	2000	I.
						53	19.9	-0100	5716 0.877 22	6361 0.965 24								0.906
6x18	52x172	96.25	2476.38	250 73	25 40	39	20.6	-0100	5477 0.939									0 938
						Mult	Multiplying	-04	1.16 0.97 1.03	1.16 0.97 1.03	1.16 0.97 1.03	1.16 0.97 1.03	1.16 0.97 1.03	1.16 0.97 1.03	1.16 0.97 1.03	1.16	1.16	
			-			14	8.8	-01004	16204 0.184 116 116	17×64 0.202 129 128	19524 0.221 139 139	21184 0.239 151 151	22844 0.257 163 163	24504 0.276 175 175				0.438
6x20	5½x19½	1 119	3398.49	345 56	28.30	15	8 8	- 51 to 4	15065 0 211 100	16614 0 232 111	18163 0 253 121	19712 0 274 131	21261 0 295 142	22810 0 316 152	24359 0.337 162 173			0.469
						16	8	1004	14067 0.240 88	15519 0 264 97	16971 0 288 106	18423 0.312 115	19875 0.336 124	21327 0.360 133	22779 0.384 142	25683 0.432 161 183		0.500

.531	563	594	.625	0.656	889	.719	0.750	0.781	813
0.	0.	0.	0.	0.	0.	0.	0.	0.	0
	25311 0.607 141 181	23922 0.676 126	22654 0.749 113	21526 0 826 103	20497 0.907 93	19549 0.991 85			
24107 0.487 142	22729 0.547 126	21476 0.609 113	20332 0.674 102	19314 0.743 92	18385 0.816 84	17529 0.892 76	16745 0.971 70		
21375 0.433 126	20147 0.486 112	19030 0.541 100	18010 0.599 90	17102 0.661 81	16273 0.725 74	15509 0.793 67	14809 0.863 62	14164 0.937 57	
20009 0 406 118	18856 0.455 105	17807 0.507 94	16849 0.562 84	15996 0.619 76	15217 0.680 69	14499. 0.743 63	13841 0.809 58	13235 0.878 53	12673 0.950 49
18643 0.379 110	17565 0.425 98	16584 0.474 87	15688 0.524 78	14890 0.578 71	14161 0.635 64	13489 0.694 59	12873 0.755 54	12305 0.820 49	11779 0.887 45
17277 0.352 102	16274 0.395 90	15361 0.440 81	14527 0.487 73	13784 0.537 66	13105 0.589 60	12479 0.644 54	11905 0.701 50	11376 0.761 46	10885 0.824 42
15911 0.324 94	14983 0.364 83	14138 0.406 74	13366 0.449 67	12678 0.496 60	12049 0.544 55	11469 0.595 50	10937 0.647 46	10446 0.703 42	9991 0.760 38
14545 0.298 86 86	13692 0.334 76	12915 0 372 68	12205 0.412 61	11572 0.454 55	10993 0.499 50	10459 0.545 45	9969 0.593 42	9517 0.644 38	9097 0.696 35
13179 0.271 78	12401 0.304 69	11692 0.33× 62	11044 0.375 55	10466 0.413 50	9937 0.454 45	9449 0.496 41	9001 0.539 38	8587 0.586 34	8203 0.633
-0100	₩ 61 60 At	22.5	3 5 1	225	-000		-0100	- 67 69	357
10.5	11.11	11 7	12.3	12.9	13.5	14.2	14.8	15.4	16.0
17	ā.	19	30	21	22	533	24	25	26
				28.30	EL .				
				348.56	1.148				
				3398.49	1.177			-	
				25	1.119				
				5½x19¾					
				6x20					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	a	In.	0.844	0 875	906 0	0 938	0,969	1.000			
pages	ni si			2000							1 15 0.97 1 03		
le see l	flection			1800							1 51 0 97 1 03		
ils tab	num De	3		1600	: .		: : :				1 15 0 97 1 03		
n of th	Maxim s in Pou			0061			: : :	: : :		: : :	1 15 0 97 1 03		
lanatio	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Sonare Inch as indicated	1041, 86		1400	11283 0.956 42	1::	: : :	::::			1.15 0 97 1 03		
ıll exp	n Poun or Unit			1300	10423 0 888 39	9998 0 955 36	* * :				1.15 0.97 1.03		
For fi	Loads i	2		1300	9562 0 820 35	9168 0 582 33	8797 0 946 30				1 15 0 97 1 03		
	al Safe		3	0011. 0001	8702 0 752 32	\$338 0 808 30	7996 0 867 28	7671 0.928 26	7371 0 991 24	: : .	1 15 0 97 1 03		
	Tota			1000	7841 0 683 29	7508 0 735 27	7194 0 788 25	6896 0 843 23	6621 0 961 21	6354 0 959 20	1 15 0 97 1 03		
	Refer-				-0120	₩ 57 55	0100	H 5/1 55	01 00	61 63	-01		
	Ratio of Span to	Ratio of Span to Span Depth Of Surfaced Timber			16.6	17	17.8	6 81	19.1	7 61	Multiplying Factor		
	S			Ft.	27	28	53	98	150	32	Multiplyii Fartor		
	Weight Per Lineal Foot (Based			Lbs.			08 86	1 119	_				
	Section Modu- lus			In.			25 × 15	1 148					
nued.	2		I= bh³		i — — —	In.4			23.5% 23.5%	1 177			
-Conti				Ng In.			107 25				-		
LABLE 20—Continued			V. 75.	In.			101	024102					
TAB				II.			- 16x3f		•				

0.156	0.188	0.219	0 250	0.281	0.313	0.344	0.375	0 406	0.438
		13290 0 238 356 178	11599 0.311 272	10280. 0.394 214	9221 0.486 173	8357 0.589 142	7630 0 701 119	7015 0.822 101	6488 0.954 87
		11951 0.215 320 -161	10427 0.280 244	9239 0.355 193	8284 0.438 155	7505 0.530 128	6849 0.631 107	6294 0.740 91	5818 0.858 78
	12407 0 140 388 167	10611 0 191 2×4	9255 0 249 217	8197 0.316 171	7347 0.389 138	6653 0.471 113	6068 0.561 95	5573 0.658 80	5149 0.763 69
	11626 0 131 364 156	9942 0.179 266	8670 0.234 203	7677 0.296 160	6879 0.365 129	6227 0.442 106	5678 0.526 89	5213 0 617 75	4814 0.716 64
13058 0 0852 490 175	10845 0.123 339	9272 0 167 248	8084 0.218 189	7156 0.276 149	6410 0.340 120	5801 0.412 99	5288 0.490 83	4853 0.576 70	4479 0.668 60
10236 11174 12111 13058 0.0669 0.0730 0.0791 0.0852 384 419 454 490 137 150 162 175	10064 0.114 315	8602 0.155 231	7498 0.202 176	6635 0.256 138	5942 0.316 111	5375 0.383 92.	4897 0.455 77	1492 0.534 65	4144 0.620
0.0730 419 150	9283 0 105 290	7932 0.143 213	6912 0 187 162	6114 0.237 127	5473 0.292 103	4949 0.353 84	4507 0.420 70	4132 0.493 60	3810 0.572 51
10236 0.0669 384 137	8502 0 0963 266	7263 0.131 195	6326 0.171 148	5594 0.217 117	5005 0.267 94	4523 0.324 77	4116 0.385 64	3771 0.452 54	3475 0.525 47
9299 0.0608 349 125	0.0876 0	6593 0 119 177	5740 0.156 135	5073 0.197 106	4536 0.243 85	4097 0.294 70	3726 0.350 58	3411 0.411 49	3140 0.477 42
-01004	-0.004	-0004	0.00	-0100	- 67 69	67 85	-0166	- 03 FB	- 01 60
0 8	9 6	11 2	8 51 8	14.4	16.0	17.6	19.2	20.8	22.4
٠٥	9	-1	20	6	10	II	12	13	14
				14.85					
				70 31					
				263.67	_				
				56.25					
	-			73×73					
		-		8x8		~			

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	D	Ju.	0.469			0.219	0.250	0.281	0 313
pages (2000		1.21				16539 0.312 276 176	14852 0.385 223
le see	Hection			1800	5398 0.986 67	1.21	-		16770 0.222 315 178	14868 0.281 248	13348 0.346 200
his tab	num De	rei		1600	4774 0.876 60	1.21 0.94 1.06		17068 0.151 366 181	14890 0.197 279	13197 0.249 220	11844 0.308 178
on of t	Maxin	indicate		1500	4462 0.822 56	1.21		15993 0.141 343 170	13950 0.185 262	12362 0.234 206	11092 0.289 166
	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	Square Inch, as indicated		1400	4149 0.767 52	1.21		14918 0.132 320 159	13010 0.172 244	11527 0 218 192	10340 0.269 155
full exp	in Pour for Unit	quare L		1300	3837 0.712 48	1.21 0.94 1.06		13843 0, 123 297 147	12070 0.160 226	10691 0.203 178	9588 0.250 144
For 1	Loads Inches,	Ω		1200	3525 0.657 44	1.21 0.94 1.06		12768 0.113 274 136	11130 0.148 209	9856 0 187 164	8836 0.231 133
	al Safe			1100	3212 0.602 40	1 21 0 94 1.06		11693 0.104 251 125	10190 0.135 191	9020 0.171 150	8084 0.212 121
1				1000	2900 0.548 36	1 21 0 94 1.06		10618 0.0942 228 113	9250 0.123 174	8185 0.156 136	7332 0.192 110
	Refer-	Num- ber			100	104		-0.004	~ 0100 4	-0264	3.5
	Ratio of Span to	Depth of Surfaced Timber	q/l		24.0	Multiplying Factor		∞ .c	10.1	11.4	12.6
		Span		Ft.	15	Mult	,	~	×	C	10
	Weight per Lineal Foot (Based	Green Timber at 38	cu. ft.)	Lbs.	14.85	1.138	1		18.80		
	Section Modu- las	S= hh2	0	In.3	70.31	1.214			112 81		
inued.	Moment of Inertia	bb3	7	In.4	263.67	1.295	1		535 86		
20—Continued	Area Cross Section	A=bh		Sq. In.	56.25	1.138			71 25		* **
	Size Surfaced Surfaced SISIE or S4S		DEC TO	1.0.	71X73				7½x9³		
TABLE	s,	Rough		In	, x				5x10		

4	LC.	9	on	0			20		1
0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	
13465 0.465 184	12304 0.554 154	11324 0.650 131	10477 0.754 112	9744 0.866 97	9099 0.985 85				1.18
12098 0.419 165	11051 0.499 138	10167 0.585 117	9403 0.678 101	8741 0.779 87	8159 0.886 76				1.18 0.95 1.05
10731 0.372 146	9798 0.443 122	9010 0.520 104	8329 0.603 89	7739 0.693 77	7219 0.788 68	6757 0.890 60	6348 0.997 53		1.18 0.95 1.05
10047 0.349 137	9172 0.415 115	8432 0.487 97	7792 0.565 83	7238 0.649 72	6749 0.738 63	6315 0.834 56	5931 0.935 49		1.18
9363 0.326 128	8545 0.388 107	7854 0.455 91	7255 0.528 78	6736 0.606 67	6279 0.689 59	5872 0.778 52	5513 0.873 46	5186 0.972 41	1.18 0.95 1.05
8680 0.302 118	7919 0.360 99	7275 0.422 84	6718 0.490 72	6235 0.563 62	5809. 0.640 54	5430 0.723 48	5095 0.810 42	4790 0.902 38	1.18 0.95 1.05
7996 0.279 109	7292 0.332 91	0.390 77	6181 0.452 66	5734 0.519 57	5339 0.591 50	4988 0.667 44	4677 0.748 39	4394 0,833 35	1.18 0.95 1.05
7313 0.256 100	6666 0.305 83	6118 0.357 71	5644 0.415 60	5232 0.476 52	4869 0.542 46	4545 0.612 40	4259 0.686 35	3998 0.764 32	1.18 0.95 1.05
6629 0.233 90	6039 0.277 76	5540 0.325 64	5107 0.377 55	4731 0.433 47	4399 0.492 41	4103 0.556 36	3841 0.623 32	3602 0.694 28	1.18 0.95 1.05
e1 co	-0100	67.00	-0.00	-0.00	67 69	357	H 02 m	-0100	H 23 4
13.9	15.2	16.4	17.7	19.0	20.2	21.5	22.7	24.0	Multiplying Factor
=	12	13	14	121	16	17	18	19	Multi
				18.80	1.123				
				112.81	1.182		· <u>-</u>		
				535.86	1.244				
				71.25	1.123				
				73x93					
				8x10					

(Table 20 Continued on Next Page.)

TABLE 20—Continued.

Deflec- tion equiv- alent to 1/32 lnch per Foot of Span	Ω	In.	0.250	0.281	0.313	0.344	0.375	0.406
E.		2000				19790 0.384 225 174	18087 0.458 188	16660 0.537 160
flections		1800			19608 0.286 245 173	17786 0.346 202	16251 0.412 169	14964 0.483 144
num De		1600		19379 0.206 269 170	17404 0.254 218	15782 0.307 179	14415 0.366 150	13269 0.430 128
Maxim s in Pou		0061	20473 0.153 320 180	18155 0.193 252	16302 0.238 204	14780 0.288 168	13497 0.343 141	12421 0.403 119
ds, and Stresses		1400	19096 0.142 298 168	16931 0.180 235	15200 0.222 190	13778 0.269 157	12579 0.320 131	11573 0.376 111
Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated	6	1300	17719 0.132 277 156	15707 0.167 218	14098 0 207 176	12776 0.250 145	11661 0.297 122	10725 0.349 103
Loads i nches, f	9	1200	16342 0.122 255 144	14483 0.155 201	12996 0.191 163	11774 0.231 134	10743 0.275 112	9878 0.322 95
Safe		1100	14965 0.112 234 132	13259 0.142 184	11892 0 175 149	10772 0 211 122	9825 0.252 102	9030 0.295 87
Tota	000	0001	13588 0.102 212 120	12035 0.129 167	10792 0.159 135	9770 0.192 111	8907 0.229 93	8182 0.268 79
Reference ence Num-			ol ol 4	-01234		07 00 4	728	-0.00
Ratio of Span to Depth of Surfaced Timber	d/l		90 90	9.4	10.4	11.5	12 5	13.6
Span		Ft.	× ×	6	10	11	12	55
Weight per Lineal Foot (Based on Green Timber at 3%	lbs. per cu. ft.)	Lbs.			22.75	2		
Section Modu- lus	9	In.3			165.31	701		
Moment of Inertia	12	In.4			950.55	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1	
Area Cross Section		Sq. In.			86.25	2		
Surfaced System		In.			72 X 112	-		
Z Hanno		ln.			8x12		-	

0.438	0.469	0.500	0.531	0.563	0.594	0.625	0.656	0.688	0.719	
15423 0.623 138	14351 0.715 120	$\begin{array}{c} 13410 \\ 0.813 \\ 105 \end{array}$	12573 0.918 92							1.16 0.95 1.04
13849 0.561 124	12882 0.643 107	12033. 0.732. 94	11277 0.826 83	10606 0.927 74						1.16 0.95 1.04
12275 0 498 110	11413 0.572 95	10655 0.650 83	9981 0.734 73	9382 0.824 65	8848 0.917 58					1.16 0.95 1.04
11488 0.467 103	10678 0.536 89	9969 0.610 78	9333 0,688 69	8770 0.773 61	8268 0.860 54	7810 0 953 49				1.16
10700 0.436 96	9943 0 500 83	9278 0.569 73	8685 0.643 64	8158 0.721 57	7688 0.802 51	7259 0.889 45	6869 0.981 41			1.16 0.95 1.04
9913 0.405 88	9209 0.465 77	8589 0.528 67	8037 0.597 59	7546 0.670 52	7108 0.745 47	6708 0.826 42	6344 0.911 38	6012 1.000 34		1.16
9126 0.374 81	8174 0.429 71	7900 0.488 62	7389 0.551 54	6934 0.618 48	6528 0 688 43	6157 0.762 38	5820 0.841 35	5511 0.923 31		1.16
8339 0.343 74	7740 0.393 64	7212 0 447 56	6741 0.505 50	6322 0.566 44	5948 0.631 39	5606 0.699 35	5295 0.771 32	5010 0.846 28	4746 0.925 26	1.16
7552 0.312 67	7005 0 358 58	6523 0.407 51	6093 0.459 45	$\begin{array}{c} 5710 \\ 0.515 \\ 40 \end{array}$	5368 0.573 35	5055 0.635 32	4770 0.701 28	4509 0.769 26	4267 0.841 23	1.16 0.95 1.04
- 01 10	-018	03 00	-225	-0.00	64 55	-0.00		-26	02 00	10.4
14.6	15.7	16.7	17.7	18.8	19.8	20.9	21.9	23.0	24.0	Multiplying Factor
#	15	16	17	18	19	20	21	22	23	Multi
				ii G	1.113					
				100	1.162					
				10 10 10 10 10 10 10 10 10 10 10 10 10 1	1.212					
				90						
				21.111	134112					
				5	7TWO					

(Tuble 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	In.	0.281	0.313	0.344	0.375	0.406	0.438
pages (n. g			2000			, ; ; ; ;		23013 0.457 190 173	21326 0.530 163
le see	effection			1800			24564 0.295 240 184	22449 0.350 201	20677 0.412 170	19156 0.477 147
his tab	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Seruses Irod, as indirected.	į		1600		24037 0.216 258 180	21802 0.262 213	19919 0.311 178	18341 0.366 151	16986 0.424 130
on of tl	Maxir Rois in Por	9	3	0091		22518 0.203 241 169	20421 0.245 200	18654 0.292 167	17173 0.343 142	15901 0.397 122
lanatio	ds, and	98	9	1400	23377 0.153 278 175	20999	19040 0 229 186	17389 0.213 155	16005 0.320 132	14816 0.371 113
ıli exp	in Pounds, and Maxim for Unit Stresses in Pou		000	1300	21690 0.142 258 163	19480 0.176 209	17659 0.213 173	16124 0.253 144	14837 0.297 122	13731 0.344 105
For fi	Loads i	5	000	1200	20003 0.131 238 150	17961 0 162 193	16278 0.196 159	14859 0.234 133	13669 0.274 113	12646 0.318 97
	al Safe		1	1100	18316 0.121 218 138	16442 0.149 176	14897 0.180 146	13594 0.214 121	12501 0.251 103	11561 0.292 88
	Tota		900	1000	16629 0.110 198 125	14923 0.135 160	13516 0.164 132	12329 0.195 110	11333 0.228 93	10476 0.265 80
	Refer-	Num- ber			101004	-0.004	H21024	-000	1004	-0100
	Ratio of Span to	of Surfaced Timber	q/2		8.0	8.9	8.9	10.7	11.6	12.4
	5	Tigado -		Ft.	6	2	Ξ	12	133	14
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			26.72			
	Section Modu- lus	S—S	9	In.3			227.81			
inued.	Moment of Inertia	bh³	12	In.4			1537.74			
20—Continued	Area Cross Section	A=bh		Sq. In.			101.25			
- 11	Size	Surfaced S1S1E	or S4S	In.			72x132			
TABLE	Ω.	Rough		In.			5x14			

691 0	0.500	0.531	0.563	0.594	0.625	0 656	0 688	0 719	0.750	0.781	
19839 0.608 142	18552 0.692 124	17414 0.781 110	16389 0.876 98	15472 0.976 87					: : :		
17815 0.547 127	16654 0.623 112	15627 0.703 99	14702 0.789 88	13874 0.879 78	13127 0.973 70						
15791 0 486 113	14756 0.553 99	13840 0.625 87	13015 0.701 78	12276 0.781 69	11609 0.865 62	11007 0.954 56					
14779 0.456 106	13807 0.519 93	12947 0.586 82	12172 0.657 72	11477 0.732 65	10850 0.811 58	10284 0.895 52	9762 0.981 48				
13767 0.426 98	12858 0.484 86	12054 0.547 76	11328 0.613 67	10678 0.684 60	10091 0.757 54	9561 0.835 49	9072 0.915 44				
12755 0 395 91	11909 0 450 80	11160 0.508 70	10485 0.570 62	9879 0.635 56	9332 0.703 50	8838 0.775 45	8382 0.850 41	7965 0.930 37			
11743 0.365 84	10960 0.415 73	10267 0.469 65	9641 0.526 57	9080 0.586 51	8573 0.649 46	8115 0.716 41	7692 0.785 37	7305 0.858 34	6952 0.934		
10731 0.334 77	10011 0.381 67	9373 0.430 59	8798 0.482 52	8281 0.537 47	7814 0.595 42	7392 0.656 38	7002 0.719 34	6645 0.787 31	6319 0.857 28	6013 0.929 26	
9719 0.304 69	9062 0.346 61	8480 0.391 53	7954 0.438 47	7482 0.488 42	7055 0.541 38	6669 0.596 34	6312 0.654 31	5985 0.715 28	5686 0.779 25	5406 0.844 23	
	27 50	-0.00	-01:50	-000	322	H 63 83	- 67 CO	-00		2 5 5	
13 3	14.2	15.1	16.0	16.9	17.8	18.7	19 6	20.4	21.3	22.2	
55	16	17	18	19	20	21	22	53	24	25	
		_		00	1.106						
				004	1 148						
				20 T T C T	1.189						
					1.106						
				71,191	12A105						
-				21.3							

(Table 20 Continued on Next Page.)

TABLE 20-Continued.

Deflec- tion equiv- alent to 1/32	Inch per Foct of Span	Q	In.	0.813		0.344	0.375	0,406	0.438
			2000		1 15 0.96 1.04				28191 0.462 189 185
flection			1800		1.15 0.96 1.04			27339 0.358 197 179	25329 0.416 170
num De	7		1600		1 15 0 96 1 04		26336 0.271 206 172	24257 0.318 175	22467 0.370 151
Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Utili Stresses in Pounds per	naicare		1500		1.15	26978 0.214 230 176	24667 0.254 193	22716 0.299 164	21036 0.347 141
ds, and Stresse	юн, ав 1		1400		1.15 0.96 1.04	25157 0.200 215 164	22998 0.237 180	21175 0.279 153	19605 0.324 131
n Poun	Transa Trans		1300		1.15	23336 0.185 199 153	21329 0.221 167	19634 0.259 142	18174 0.300 122
Loads in	Ž,		1200		1.15	21515 0.171 183 141	19660 0.204 154	18093 0.239 130	16743 0.277 112
l Safe		9	0011		1 15 0.96 1.04	19694 0.157 168 129	17991 0.187 141	16552 0.219 119	15312 0.254 103
Tota		000	0001	5145 0.914 21	1 15 0.96 1.04	17873 0.143 152 117	16322 0.170 127	15011 0.199	13881 0.231 .93
Refer-	Num- ber			- 67 89	H04	101004	101004	+387	-004
Ratio of Span to	Depth of Surfaced Timber	1/h		23.1	Multiplying	00 rci	8.0	10.1	10.8
2	nada		F.	26	Mult	=	12	13	14
Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft)	Lbs.	26.72	1.106		30.68	1.101	
Section Modu- lus	bh²	9	In.3	227.81	1.148		300.31	1.136	
Moment of Inertia	bh³	12	In.4	1537.74	1.189		2327.43	1.174	
Area Cross Section	A==bh		Sq. In.	101.25	1.106		116.25	1.101	
, ize	Surfaced	or S4S	In.	73×132			72x152		
<i>I</i> ,	Rough		In.	8x14			8x16		

0.469	0 200	0 531	0.563	0 594	0 625	0.656	0.688	0.719	0 750
26240 0.530 164	24529 0.603 144	23058 0 681 127	21705 0 763 113	20497 0.850 101	19407 0.942 91				
23570 0.477 147	22027 0.543 129	20700 0.613 114	19479 0.687 101	18389 0 765 91	17405 0.548 82	16526 0 935 74			
20900 0.424 131	19525 0 483 114	18342 0.545 101	17253 0.611 90	16281 0.680 80	15403 0.754 72	14618 0.831 65	13888 0.912 59	13227 0.997 54	
19565 0.398 122	18274 0.453 107	17163 0 511 95	16140 0 572 84	15227 0 637 75	14402 0.706 67	13665 0.779 61	12978 0.855 55	12356 0.935 50	
18230 0.371 114	17023 0.422 100	15984 0 477 88	15027 0 534 78	14173 0 595 · 70	13401 0.659 63	12711 0.728 57	12068 0.798 51	11485 0.872 47	10947 0.950 43
16895 0 345 106	15772 0.392 92	14805 0.443 82	13914 0.496 72	13119 0.552 65	12400 0.612 58	11757 0.676 53	11158 0.741 48	10614 0.810 43	10113 0.882 46
15560 0.318 97	14521 0.362 85.	13626 0.409 75	12801 0.458 67	12065 0.510 60	11399 0 565 53	10803 0.624 48	10247 0.684 44	9744 0.748 40	9278 0.814 36
14225 0.292 89	13270 0.332 78	12447 0 375 69	11688 0.420 61	11011 0.468 54	10398 0.518 49	9849 0.572 44	9337 0.627 40	8873 0.686 36	8444 0.746 33
12890 0.265 81	12019 0.302 70	11268 0 341 62	10575 0.382 55	9957 0.425 49	9397 0.471 44	8895 0.520 40	8427 0.570 36	8002 0.623 33	7609 0.679 30
-0100	m 01 00		-2420	-018	 0100	61 50	-0100	325	- 01 80
11.6	12 4	13.2	13 9	14 7	15 5	16.3	0 21	17.8	18.6
15	16	17	18	19	20	21	22	23	24
				30.68	1 101				
				300.31	1.136		6		
				2327.43	1.174		,		
				116.25	1.101				
				7½x15½					
				8x16					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflection equivalent	Inch per Foot of Span	2	In.	0.781	0.813	0.844	0.875		0.375
pages	is in			2000					1.14	
ole see	Total Safe Loads in Pounds, and Maximum Deflections Inches, for Unit Stresses in Pounds per			1800					1.14 0.97 1.03	
his tal	od spun			1600					1.14 0.97 1.03	
on of t	Maxin Po	licated	_	1500					1.14 0.97 1.03	31489 0.225 219 182
olanati	ids, and	h, as inc	_	1400					1.14	29362 0.210 204 170
'ull ex	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per	Square Inch, as indicated	_	1300	9651 0 958 36				1.14	27235 0.195 189 158
For 1	Loads Inches,	n. Odn		1200	8850 0.884 33	8446. 0.956 30			1.14 0.97 1.03	25108 0.180 174 146
	al Safe			1100	8048 0 811 30	7675 0.876 28	7334 0 945 25		1.14 0.97	22981 0 165 160 134
				1000	0.737 27	6905 0.796 25	6592 0.859 23	6293 0.923 21	1.14 0.97 1.03	20854 0.150 145 122
	Refer-	Num- ber			- 21 62	03 69	-010	-0.00	124	-284
	Ratio of Span to	Depth of Surface	1/7		19 4	20 1	30.9	21.7	Multiplying Factor	2.2
	:	Zpan		Ft.	25	26	27	28	Multi	12
	Weight per Lineal Foot 'Based	Green Timber at 38	cu. ft.	Lbs.			30.68			
	Section Modu- lus	bh:	٠.	In.3			300.31];	
inued.	Moment of Inertia	bh³	2	In.1			2327.43			
20-Continued	Area Cross Section	1= bh		Sq. In.			116.25			
LE 20.	Size	Surfaced S1S1E or S4S		In.	-		72x152			
TABLE	<i>\$7</i> 3	Rough		Ii.	-		8x16			

Sals 7]all 25 3349 61 382.81											
13 8.9 2 1.076 1184 121 2226 2246 2368 2868	406	438	469	200	531	563	594	325	926	888	
13 8.9 12 14 15 15 15 15 15 15 15	0.	0	0.			0.		0.6	0.6	0.6	
13 8.9 2 0.176 194 0.121 2.2004 2.200 2.200 2.200 0.247 0.265 0.225 0.247 0.265 0.225 0.247 0.265 0.225 0.247 0.245 0.225 0.247 0.247 0.245 0.225 0.245 0.247				31346 0.534 163 182	29431 0.603 144	27736 0.676 128	26222 0.753 115	24827 0.834 103	23573 0.920 94		
13 8.9 2 1.774 1956 230 1.8											
13 13 13 13 14 14 15 14 15 15 14 15 15	30942 0 282 198 180							19723 0.668 82	18713 0.736 74	17798 0.808 67	
13 8.9 12 174 1745 1956 135 148 151								18447 0.626 77			
73×172 131.25 3349.61 382.81 4.63 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13.						19228 0.473 89	18158 0.527 80			15478 0.708 59	
73×17½ 131.25 3349.61 382.81 34.63 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13.											
73x17½ 131.25 3349.61 382.81 34.63 17 18 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19			19892 0.282 110		17423 0.362 85	16392 0.406 76	15470 0.452 68	14619 0.501 61	13853 0.552 55	13118 0.606 50	;e.)
73x17½ 131.25 3349.61 382.81 34.63 17 18 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19					15922 0.332 78			13343 0.459 56	12638 0.506 50		xt Pag
73x17½ 131.25 3349.61 382.81 34.63 17 18 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19	0.170 0.176 123	17745 0 205 106	16490 0.235 92	15396 0.267 80	14421 0.301 71	13556 0.338 63	12782 0.377 56	12067 0.417 50	11423 0.460 45	10838 0.505 41	on Ne
73x17½ 131.25 3349.61 382.81 34.63 17 18 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19	10004	→ 01 00	-01624		-0.00	67 89	-0.8	-0100	327	357	tinued
73x172 131.25 3349.61 382.81 34.63 1.097 1.161 1.129 1.097	8.9		10.3								20 Con
73×172 131.25 3349.61 382.81 1.097 1.161 1.129	13	14	15	16	17	18	19	20	21	22	(Table
7½x17½ 131.25 3349.61 1.097 1.161					34.63						
7½x17½ 131.25 1.097					382.81						
73x173 131.25 1.097					1,161						
10 11 12 12 13 14 15 16			4 200								
8x18					73x173						
					8x18						

For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32 Inch per Foot of Span		Q	In.	0.719	0.750	187 0	0.813	0.844	0.875	906.0
			2000								
	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated			1800	19185 0.994 70						
				1600	16965 0.884 62	16193 0.961 56			: : :		
					15855 0.829 57	15129 0.901 53	14449 0.979 48				
lanatio				1400	14745 0.773 53	14065 0.841 49	13428 0.914 45	12844 0.987 41			
Il expl			000	1300	13635 0.718 49	13001 0.781 45	12407 0.848 41	11862 0.917 38	11350 0.989 35		
For fi			000+	1200	12525 0.663 45	11937 0.721 41	11386 0.783 38	10881 0.846 35	10405 0.913 32	9968 0.982 30	
			. 5	OKAT	11415 0.608 41	10873 0.661 38	10365 0.718 35	9899 0.775	9460 0.837 29	9057 0.900 27	8675 0.965 25
			0001	1000	10305 0.552 37	9809 0.601 34	9344 0.652 31	8917 0.705 29	8515 0.761 26	8145 0.818 24	0.877
	Reference ence Num- ber				222	C3 C3 FF	-12100	2 2 5	⇔ ∞	-0100	H 63 60
LE 20—Continued.	Ratio of Span to Depth of Surfaced Timber 1/h				15.8	16.5	17.1	17.8	18.5	19.2	19.9
	Span			121	23	24	1.5	36	27	200	29
	Weight per Lineal Foot (Based on Green Timber at 38 lbs. ft.)		lbs. per cu. ft.)	Lbs.				34.63			
	Section Modu- lus	S=6		In.3				382.81			_
	Moment of Inertia	bh³	bh³ 12					3349.61			_
	Area Cross Section	A=bh		Sq. In.			A house	131.25			_
	Size	rfaced		In.				72x173			
TABLE	Rough			In.	_			00 11 00			

0.938		0.438	0.469	0.500	0.531	0.563	0.594	0.625	
::	1.13 0.97 1.03					34526 0.607 144 181	32627 0.676 129	30929 0.749 116	
	1.13 0.97 1.03			35041 0.432 164 183	32897 0.487 145	31004 0.547 129	29291 0.609 116	27759 0.674 104	
	1.13 0.97 1.03		33214 0.337 166 173	31079 0.384 146	29169 0.433 129	27482 0.486 114	25955 0.541 102	24589 0.599 92	
	1.13	33405 0.276 179 174	31102 0.316 156	29098 0.360 136	27305. 0.406 121	25721 0.455 108	24287 0.507 96	23004 0.562 86	
	1.13 0.97 1.03	31142 0.257 167 163	28990 0.295 145	27117 0.336 127	25441 0 379 112	23960 0 425 100	22619 0.474 89	21419 0.524 80,	
	1.13 0.97 1.03	28879 0.239 155 151	26878 0.274 134	25136 0.312 118	23577 0.352 104	22199 0 395 93	20951 0.440 83	19834 0.487 74	
	1 13 0.97	26616 0.221 143 139	24766 0.253 124	23155 0.288 109	21713 0.324 96	20438 0.364 85	19283 0.406 76	18249 0.449 68	ge.)
	1.13	24353 0.202 130 128	22654 0.232 113	21174	19849 0.298 88	18677 0.334 78	17615 0.372 70	16664 0.412 63	ext Pa
7468 0.939	1.13	22090 0.184 118 116	20542 0.211 103	19193 0.240 90	17985 0.271 79	.16916 0.304 71	15947 0.338 63	15079 0.375 57	on Ne
-0100	-00 -04 H		H 67 65 44	-0004	3.21	H01624	-0100	~~0	20 Continued on Next Page.
20.6	Multiplying Factor	9.2	8.6	10 5	11.11	11.7	12.3	e 20 Co	
30	Mult	14	10	16	17	18	19	20	(Table
	,	,			1.094				
		1			1.121				
					4634.30				
					146.25				
		1			7½x19½		, ,		
					8x20				

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									and the second s		
For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32 Inch per Foot of Span		D	In.	0.656	0.685	0.719	0.750	0.781	0.813	0.844
			2000	29370 0.826 105	27972 0.907 95	26673 0.991 87					
	flections	000		1800	26352 0.743 94	25090 0.816 86	23917 0.892 78	22853 0.971 71			
	um Dei		000		23334 0.661 83	22208 0.725 76	21161 0.793 69	20211 0.863 63	19324 0.937 58		
	Maxim 8 in Pou	Maxim in Pou		1500	21825 0.619 78	20767 0.680 71	19783 0.743 64	18890 0.809 59	18056 0.878 54	17282 0.950 50	
	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1400		20316 0.578	19326 0.635 66	18405 0.694 60	17569 0.755 55	16788 0.820 50	16063 0.887 46	15395 0.956 43
			1300		18807 0.537 67	17885 0.589 61	17027 0.644 56	16248 0.701 51	15520 0.761 47	14844 0.824 43	14221 0 888 40
			1200		17298 0.496 62	16444 0.544 56	15649 0.595 51	14927 0 647 47	14252 0.703 43	13625 0.760 39	13047 0 820 36
			1100		15789 0.454 56	15003 0.499 51	14271 0.545 47	13606 0 593 43	$\frac{12984}{0.644}$	12406. 0.696 36	11873 0.752 33]
			1000		14280 0.413 51	13562 0.454 46	12893 0.496 42	12285 0.539 38	11716 0.586 35	11187 0.633 32	10699 0 683 30
	Reference ence Num- ber				-000	252		- 62 65	~00	₩ 63 65	- 62 65
	Ratio of Span to Depth of Surfaced Timber				12.9	13 5	14 2	14 8	15 4	16 0	16 6
	Span			Ft.	21	21	23	24	2.5	26	27
LE 20—Continued.	Weight per Lineal Food On Green Timber at 38 at 38 elbs, per		lbs. per cu. ft.)	Lbs.			00 10 30				
	Section Modu- lus	S= ph2		In.3			475 31	1 121			
	Moment of Inertia	bh ³		ln.4			4634.30	1 150			
	Area Cross Section	A=bh		Sq. In.	=-		146.25				
	Size	rfaced		In.			73x193				
TABLE	Rough			In.			5x20				

						and of a disease of				
0.875	906.0	0.938	696.0	1.000		0.219	0.250	0.281	0.313	
					1 12 0.97 1.03			20946 0.312 279 176	18802 0.385 226	
			: : :		1.12 0.97 1.03		21247 0.222 319 178	18830 0.281 251	16898 0.346 203	
		:	:::		1.12 0.97 1.03	21609 0.151 371 181	18865 0.197 283	16714 0.249 223	14994 0.308 180	
					1.12 0.97 1.03	20248 0.141 347 170	17674 0.185 265	15656 0.234 209	14042 0.289 169	
::					1.12 0.97 1.03	18887 0.132 324 159	16483 0.172 247	14598 0.218 195	13090 0.269 157	
13636 0.955 37					1.12 0.97 1 03	17526 0.123 301 147	15292 0 160 229	13540 0.203 181	12138 0.250 146	
12504 0.882 34	11998 0.946 31				1.12 0.97 1.03	16165 0.113 277 136	14101 0.148 211	12482 0.187 166	11186 0.231 134	ge.)
11372 0.808 30	10905 0 867 28	10459 0.928 26	10047 0.991 24		1.12 0.97 1.03	14804 0.104 254 125	12910 0.135 194	11424 0.171 152	10234 0.212 123	ext Pa
10240 0.735 27	9812 0.788 25	9403 0.843 24	9025 0.901 22	8671 0.959 20	1.12 0.97 1.03	13443 0.0942 230 113	11719 0.123 176.	10366 0.156 138	9282 0.192 111	on Ne
04 85	 €2 €5	22.5	67 55	- 01 60	H 22 44	10004	1204			tinued
17.2	17.8	18.5	19.1	. 19.7	Multiplying Factor	∞ ∞	1.61	11.4	12.6	20 Continued on Next Page.)
82	29	30	31	32	Mul	-1	∞	6	10	(Table
		38.58	1.094				23.81	8		
		475.31	1.121			1	142.89	99		
		4634.30	1.150				678.76	777		
		146.25	1.094				90.25	001		
		7½x19½					9½x9½			
		8x20					10x10			

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For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	In.	0.344	0.375	0.406	0.438	0.469	0.500	0.531
9 səgec	.g			2002	17054 0.465 186	15584 0.554 156	14336 0.650 132	13271 0.754 114	12339 0.866 99	11521 0.985 86	
le see 1	Hection			1800	15322 0 419 167	13997 0.499 140	12871 0 585 119	11911 0.678 102	11069 0.779 89	10331 0.886 78	
ais tab	Loads in Pounds, and Maximum De luches, for Unit Stresses in Pounds per	-		1500	13591 0.372 148	12410 0.443 124	11407 0.520 105	10550 0.603 90	9800 0.693 78	9141 0.788 69	8557 0.890 60.
on of th	Maxin	indicate	i i	noet	12725 0.349 139	11617 0.415 116	10675 0.487 99	9870 0.565 85	9165 0.649 73	8546 0.738 64	7997 0.834 56
Japatic	ids, and Stresse	100, as 1	001	1400	11859 0.326 129	10823 0.388 108	9942 0 455 92	9190 0.528 79	8530 0.606 68	7950 0 689 60	7436 0.778 52
ull exp	in Pour for Unit	equare inch, as indicated	000	00001	10993 0.302 120	10030 0.360 100	9210 0.422 85	8510 0.490 73	7895 0.563 63	7355 0.640 55	6876 0.723 49.
For f	Loads Inches,	ā I	900	1200	10128 0.279 111	9236 0.332	8478 0.390 78	7829 0.452 67	7261 0.519 58	6760 0.591 51	6316 0.667 45
	Reference Number		1100	37.5	9262 0.256 101	8443 0.305 84	7745 0.357 72	7149 0.415 61	6626 0.476 53	6165 0.542 46	5756 0.612 41
			1000	7000	8396 0.233 92	7649 0.277 76	7013 0 325 65	6469 0 377 55	5991 0.433 48	5570 0.492 42	5196 0.556 37
					-0100		-0.00		922	-10100	-0369
	Ratio of Span to	Depth of Surfaced Timber	۳/√		13.9	15.2	16.4	17.7	19.0	20.2	21.5
		Span		Ff.	11	12	13	14	15	16	17
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			23 81				
	Section Modu-	bh²	9	In.3			142 89	1 166			
nued.	Moment of lnertia		12	In.4			678.78	1.227			
20-Continued	Area Cross Section	A=bh		Sq. In.			90 25	1 108			
	Size	Surfaced	or S4S	In.			94x94				
TABLE	30	Rough		In.		,	10x10				

0.563	0.594		0.250	0.281	0.313	0.344	0.375	0.406	0.438	
		1 17 0 95 1.05				25083 0.384 228 174	22934 0.458 191	21105 0.537 162	19546 0.623 140	
		1.17			24840 0.286 248 173	22543 0 346 205	20606 0.412 172	18957 0.483 146	17551 0.561 125	
8035 0 997 54		1.17		24556 0.206 273 170	22048 0.254 220	20003 0.307 182	18278 0.366 152	16809 0.430 129	15556 0.498 111	
7506 0 935 50		1.17 0.95 1.05	25959 0.153 325 180	23005 0.193 256	20652 0.238 207	18733 0.288 170	17114 0.343 143	15735 0.403 121	14559 0.467 104	
6977 0.873 46	6565 0.972 41	1 17 0.95 1.05	24213 0.142 303 168	21454 0.180 238	19256 0.222 193	17463 0.269 159	15950 0.320 133	14661 0.376 113	13561 0.436 97	
6418 0 810 43	6064 0.902 38	1 17 0.95 1.05	22467 0.132 281 156	19903 0.167 221	17860 0.207 179	16193 0.250 147	14786 0.297 123	13587 0.349 104	12564 0.405 90	
5919 0.748 39	5562 0.833 35	1.05	20721 0.122 259 144	18352 0.155 204	16464 0.191 165	14923 0.231 136	13622 0.275 114	12513 0.322 96	11566 0.374 83	
5390 0 686 36	5061 0.764 32	1.17	18975 0.112 237 132	16801 0.142 187	15068 0.175 151	13653 0.211 124	12458 0.252 104	11439 0.295 88	10569 0.343 75	
, 4861 0 623 32	4560 0.694 29	1 17 0.95	17229 0.102 215 120	15250 0.129 169	13672 0.159 137	12383 0.192 113	11294 0.229 94	10365 0.268 80	9571 0.312 68	İ
-0100	01:00	H 21 44	-004	-01034	01 00 41	1264	128	-0.69	H 63 €0	
22.7	24.0	Multiplying Factor	00 60	9.4	10.4	11.5	12.5	13.6	14.6	000
20	19	Multi	00	6	10	Ξ	12	13	14	
,					28.83	1.098				
1			1		209.40	1.145				
					1204.03	1.196				
					109.25	1.098				
1					94x113					
					10x12					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	Q	In.	0.469	0.500	0.531	0.563	0.594	0.625	0.656
ages 6				2000	18183 0.715 121	16989 0.813 106	15946 0.918 94				
e see I	flection			1800	16321 0.643 109	15244 0.732 95	14302 0.826 84	13449 0.927 75			
is tab	num De	d		1600	14460 0.572 96	13499 0.650 84	12659 0.734 75	11897 0.824 66	11212 0.917 59		
n of th	Maxim s in Pou	ndicate		1500	13529 0.536 90	12627 0.610 79	11837 0.688 70	11121 0.773 62	10477 0.860 55	9893 0.953 49	
lanatic	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Util Stressen Pounds per	oquare Inch, as indicated		1400	12598 0.500 84	11754 0.569 73	11015 0.643 65	10345 0.721 57	9742 0.802 51	9195 0.889 46	8704 0 981 41
ull exp	in Poun for Unit	quare II		1300	11667 0.465 78	10882 0.528 68	10193 0.597 60	9569 0.670 53	9007 0.745 47	8497 0.826 42	8039 0.911
For fi	Loads i	ā		1200	10737 0.429 72	10009 0.488 63	9372 0.551 55	8793 0.618 49	8272 0.688 44	7799 0.762 39	7374 0.841 35
	al Safe		9	0011	9806 0.393 65	9137 0.447 57	8550 0.505 50	8017 0.566 45	7537 0.631 40	7101 0.699 36	6709 0.771
			9	1000	8875 0.358 59	8264 0.407 52	7728 0.459 45	7241 0.515 40	6802 0.573 36	6403 0 635 32	6044 0.701 29
	Refer-	Num- ber			222	-0160	357	-2160	1000	07 00	327
	Ratio of Span to	Depth of Surfaced Timber	1/h		15 7	16.7	17.7	18. ×	19.8	20.9	21.9
	7	opan		Ft.	15	16	17	18	19	20	21
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			28 83	1 098			
	Section Modu-	S	9	Ĭn.3			209 40	1.145			
inued.	Moment of Inertia	I bh3	12	ln.4			1204 03	1.196			
-Continued	Area Cross Section	A=bh		Sq. ln.			109.25				
LE 20	Nize	Surfaced	OF 545	In,	-	-	9±x11±				
TABLE	₹.	Rough		In.			10x12				

					-					
0.688	0.719		0 281	0,313	0.344	0.375	0.406	0.438	0.469	
		1.15					29160 0.457 192 173	27006 0.530 166	25132 0.608 144	
		1 15 0.95 1.04			31092 0.295 242 184	28448 0.350 203	26200 0.412 173	24258 0.477 149	22568 0.547 129	
		1.15 0.95 1.04		30429 0.216 261 180	27596 0.262 215	25242 0.311 180	23240 0.306 153	21510 0.424 132	20004 0.486 114	
		1 15 0.95 1.04		28506 0.203 244 169	25848 0.245 202	23639 0.292 169	21760 0.343 143	20136 0.397 123	18722 0.456 107	
		1.15 0.95 1.04	29613 0 153 282 175	26583 0.189 228	24100 0.229 188	22036 0.273 157	20280 0.320 134	18762 0.371 115	17440 0.426 100	
7617 1.000 35		1.15 0.95 1.04	27476 0.142 262 163	24660 0.176 211	22352 0.213 174	20433 0.253 146	18800 0.297 124	17388 0.344 106	16158 0.395 92	
6983 0.923 32		1 15 0.95 1.04	25339 0.131 241 150	22737 0.162 195	20604 0.196 161	18830 0.234 134	17320 0.274 114	16014 0.318 98	14876 0.365 85)	ge.)
6348 0.846 29	6015 0.925 26	1.15 0.95 1.04	23202 0.121 221 138	20814 0.149 178	18856 0.180 147	17227 0.214 123	15840 0.251 104	14640 0.292 90	13594 0.334 78	axt Pa
5713 0 769 26	5408 0.841 24	1 15 0.95 1.04	21065 0 110 201 125	18891 0.135 162	17108 0.164 133	15624 0.195 112	14360 0.228 95	13266 0.265 81	12312 0.304 70	on Ne
-0100	67 65	-04	12284	-004		- 67 65	-21004	-0.00	67 60	tinued
23.0	24.0	Multiplying Factor	8.0	Ø. Ø.	Ø.	10.7	11.6	12.4	13.3	(Table 20 Continued on Next Page.)
22	53	Mul	6	10	11	12	13	14	15	(Table
					33.85	1.091				
					288.56	1.132				
					1947.80	1.174				
					128.25	1.091				
					9½x13½					
					10x14					

TABLE 20-Continued.

For full explanation of this table see pages 68 to 70.

Deflection equivalent to 1/32	Inch per Foot of Span	Q	In.	0.500	0.531	0.563	169 0	0.625	0.656	0.688
			2000	23498 0.692 126	22045 0.781 111	20771 0.876	19597 0.976 88			
Total Safe Loads in Pounds, and Maximum Deflections in Inchest for Unit Stresses in Pounds per			1800	21094 0.623 113	19783 0 703 100	18633 0.789 89	17573 0.879 79	16637 0.973 71		
Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per			1600	18690 0.553 100	17521 0 625 88	16495 0.701 79	15549 0.781 70	14713 0.865 63	13945 0.954 57	
Maxin s in Pov	naica ver		1500	17488 0.519 94	16380 0.586 83	15426 0.657 73	14537 0.732 66	13752 0.811 59	13029 0.895 53	12365 0.981 48
in Pounds, and Maxim for Unit Stresses in Pou	, de 1	9	1400	16286 0.484 87	15259 0.547 77	14357 0.613 68	13525 0.684 61	12790 0.757 55	12113 0.835 49	11491 0.915 45
n Poun	Transport	000	1300	15084 0.450 81	14128 0.508 71	13288 0.570 63	12513 0.635 56	11828 0.703 51	11197 0.775 46	10617 0.850 41
Loads i	ž	0007	1200	13882 0.415 74	12997 0 469 '66	12219 0.526 58	11501 0.586 52	10866 0.649 47	10281 0.716 42	9743 0.785 38
ll Safe		9	0017	12680 0.381 68	11866 0 430 60	11150 0.482 53	10489 0.537 47	9904 0.595 42	9365 0.656 38	8869 0.719 35
Tota		900	1000	11478 0.346 62	10735 0 391 54	10081 0.438 48	9477 0.488 43	8942 0.541 38	8449 0.596 34	7995 0.654 31
Refer-	Num- ber			-26	- 0100	352	- 2100	-0100	-0100	-0100
Ratio of Span to	Of of Surfaced Timber	1/h		14.2	15.1	16.0	16 9	17.8	16.7	19.6
	nedo		Ft.	16	11	18	19	20	21	35
Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				33 85			
Section Modu- lus	bh² S——S	9	In.3				2×× 56			
Moment of Inertia	bh³	12	In.4				1947 ×0			
Area Cross Section	A=bh		Sq. In.				12× 25 1947 ×0 1.091 1.174			
Size	Surfaced	or S4S	In.				9½x13⅓			
7.	Rough		In.				10x14			

0.719	0.750	0 781	0 813		0.344	0.375	0.406	0.438	0.469
				1 13 0 96 1 04				35696 0.462 191 185	33237 0.530 166
			: : :	1 13 0 96 1.04			34613 0.358 200 179	32072 0.416 172	29855 0.477 149
				1 13 0.96 1 04		33325 0.271 208 172	30711 0.318 177	28448 0.370 152	26473 0.424 132
			:::	1.04	34162 0.214 233 176	31213 0.254 195	28760 0.299 166	26636 0.347 143	24782 0.398 124
			: : :	1.13 0.96 1.04	31856 0.200 217 164	29101 0.237 182	26809 0.279 155	24824 0.324 133	23091 0.371 115
10089	5 : : :			1.13	29550 0.185 201 153	26989 0.221 169	24858 0.259 143	23012 0.300 123	21400 0.345 107
9253	82 S			1.13	27244 0.171 186 186	24877 0.204 156	22907 0.239 132	21200 0.277 114	19709 0.318 99
8417 0 787 21	8007 0.857 . 29	7617 0.929 26		1.13 0.96 1.04	24938 0.157 170 129	22765 0.187 142	20956 0.219 121	19388 0.254 104	18018 0.292 90
7581	7205 0.779 26	6848 0.844 23	6519 0 914 21	1.13 0.96 1.04	22632 0.143 154 117	20653 0.170 129	19005 0.199 110	17576 0.231 94	16327 0.265 82
- c1 c	0 - 0100	-03:5	01 00	- C) - 1	-03.82	H 63 50 44	H 01 00 H	H01004	
20 4	21.3	22.2	23.1	Multiplying Factor	80	9.3	10.1	10.8	11.6
23	24	25	26	Mult	= -	12	13	14	15
		33.85			1		38.88		
		288.56					380.40		
		1947.80		/			2948.07		
American		128.25					1.086		
		94x133					9½x15½		
		10x14					10x16		

(Table 20 Continued on Next Page.)

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	-										
For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	ln.	0.500	0.531	0.563	0.594	0.625	0.656	0.688
ages (2000	31078 0.603 146	29179 0.681 129	27480 0.763	25961 0.850 102	24603 0.942 92		: : :
le see 1	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Senare Inch as indicated			1800	27908 0.543 131	26195 0.613 116	24662 0.687 103	23291 0.765	22065 0.848 83	20928 0.935 75	
is tab]	um De	4		1600	24738 0.483 116	23211 0.545 102	21844 0.611 91	20621 0.680 81	19527 0.754 73	18512 0.831 66	17593 0.912 60
n of th	Maxim 8 in Pou			1500	23153 0.453 108	21719 0.511 96	20435 0.572 85	19286 0.637 76	18258 0.706 69	17304 0.779 62	16440 0.855 56
lanatio	Loads in Pounds, and Maximum De Inches, for Unit Streess in Pounds per Senare Ireh as indicates	om (ma		1400	21568 0.422 101	20227 0.477 89	19026 0.534	17951 0.595 71	16989 0.659 64	16096 0.728 58	15287 0.798 52
ıll exp]	a Pound or Unit			1300	19983 0,392 94	18735 0.443 83	17617 0.496 73	16616 0.552 66	15720 0.612 59	14888 0.676 53	14134 0.741 48
For fu	Loads in			1200	18398 0.362 86	17243 0.409 ~76	16208 0.458 68	15281 0.510 60	14451 0.565 54	13680 0.624 49	12981 0.684 44
	l Safe]			0011	16813 0.332 79	15751 0.375 69	14799 0.420 62	13946 0 468 55	13182 0.518 49	12472 0.572 45	11828 0.627 40
					15228 0.302 71	14259 0.341 63	13390 0.382 56	12611 0 425 50	11913 0.471 45	11264 0.520 40	10675 0.570 36
	Ratio of Span Depth Color Number Color Numbe				700	-0100	0100	327	-000	200	#10100
			of Surfaced Timber I/h		12.4	I3 2	13 9	14 7	15.5	16.3	17 0
		Ties d'a		Ft.	16	17	18	19	20	21	22
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				38 88		6	
	Section Modu- lus	bh²	9	In.3				380 40 1.122			
nued.	Moment of Inertia	l- bh³	12	ln.4				2948 07 1 158			
-Continued	Area Cross Section	A=bh		Sq. In.				147 25 1			
LE 20	Size	Surfaced	242 243	In.				9½x15½	-		
TABLE	20.	Rough		In.				10x16			

. 719	.750	0.781	.613	844	578		0.375	0.406	.438	
0.	· · ·		.0	.0	-0		0		0.	
						1.12 0.97 1.03				
						1.12 0.97 1.03				
16754 0 997 55						1.12 0.97 1.03		39205 0.282 201 180	36330 0.327 173	
15651 0.935 51						1.12 0.97 1.03	39853 0.225 221 182	36719 0.265 188	34021 0.307 162	
14548 0.872 47	13851 0.950 43					1.12 0.97 1.03	37161 0.210 206 170	34233 0.247 176	31712 0.287 151	
13445 0.810 44	12795 0.882 40	12223 0.958 37				1.12 0.97 1.03	34469 0.195 192 158	31747 0.229 163	29403 0.266 140	
12342 0.748 40	11739 0.814 37	11208 0.884 34	10699 0.956 31			1.12 0.97 1.03	31777 0.180 177 146	29261 0.212 150	27094 0.246 129	;e.)
11239 0 686 37	10683 0.746 33	10193 0.811 31	9723 0 876 28	9285 0.945 26		1.12 0.97 1.03	29085 0.165 162 134	26775 0.194 137	24785 0.225 118	xt Pag
10136 0.623 33	9627 0.679 30	9178 0.737 28	8747 0.796 25	8345 0.859 23	7971 0.923 21	1.12 0.97 1.03	26393 0.150 147 122	24289 0.176 125	22476 0.205 107	on Ne
- 01 50	-00	-00	-0100	-200	-0100	H 22 4	1 21 02 4	C1 co 4	0700	tinued
17.8	18 6	19.4	20.1	20.9	21.7	lying	8.2	6.8	9.6	Table 20 Continued on Next Page.)
	24	25	26	27	28	Multiplying Factor	12	13	14	(Table
			38.88					1.083		
			380.40					1.114		
			1.158					1.145		
			147.25 2				1	1.083		
			9½x15½	•				92x1/2		
			10x16					10x18		

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For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	Q	In.	0.469	0.500	0.531	0.563	0.594	0.625
pages (2000		39698 0.534 165 182	37274 0.603 146	35110 0.676 130	33186 0.753 116	31442 0.834 105
le see	flection			1800	38096 0.423 169 175	35658 0.481 149	33472 0.543 131	31520 0.609 117	29784 0.678 104	28210 0.751 94
lis tab	aum De	5		1600	33790 0.376 150	31618 0.427 132	29670 0.482 116	27930 0.541 103	26382 0.603 93	24978 0.668 83
n of tl	Maxin s in Pou	nareate		1500	31637 0.352 141	29598 0.401 123	27769 0 452 109	26135 0.507 97	24681 0.565 87	23362 0.626 78
lanatio	ids, and Stresse	icii, as i		1400	29484 0.329 131	27578 0.374 115	25868 0.422 101	24340 0.473 90	22980 0.527 81	21746 0.584 73
ull exp	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresse in Pounds per	quate 1		1300	27331 0.305 121	25558 0.347 107	23967 0.392 94	22545 0.440 84	21279 0.490 75	20130 0.543 67
For f	Loads Inches,	-		1200	25178 0.282 112	23538 0.321 98	22066 0.362 87	20750 0.406 77	19578 0 452 69	18514 0.501 62.
	al Safe		1	1100	23025 0.258 102	21518 0.294 90	20165 0.332 79	18955 0.372 70	17877 0.414 63	16898 0.459 56
	Tot		9	1000	20872	19498 0.257 81	18264 0 301 72	17160 0.338 64	16176 0.377 57	15282 0.417 51
	Refer-	Num- ber			-2254		₩0.85	- C7 C9	-0100	3 2 3
	Ratio of Span to	of Surfaced Timber	Ψ/2		10.3	11.0	11 7	12.3	13.0	13.7
	5	nade -		Ft.	15	16	17	18	19	20
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			43 89			
	Section Modu- lus	S-bh²	9	In.3			484 90			
nued.	Moment of lnertia	bh³	12	In.4			1.145			
-Continued.	Area Cross Section	A=bh		Sq. In.			166 25			
20	Size	Surfaced	or S4S	Jp.		w · Sambigrappy Admi	9½x17½	-		
TABLE	<i>V</i> 2	Rough		In.			10x18	-		

0.656	0.688	0 719	0.750	0.781	0 813	0.844	0.875	906.0	0.938		
29859 0,920 95		: : :		::.				111		1.11 0.97 1.03	
26781 0 828 85	25477 0.909 77	24281 0.994 70	:		. : :					1.11	
23703 0.736 75	22539 0.808 68	21471 0.884 62	20483 0.961 57		:	: : :				0.97	
22164 0.690 70	21070 0.758 64	20066 0.829 58	19137 0.901 53	18298 0.979 49						1.11	
20625 0.644 66	19601 0.708 59	18661 0.773 54	17791 0.841 49	17005 0 914 45	16261 0.987 42					1.11 0.97 1.03	
19086 0 598 61	18132 0.657 55	17256 0.718 50	16445 0 781 46	15712 0 848 42	15018 0.917 38	14376 0.989 36				1.11 0.97 1.03	
17547 0.552 56	16663 0.606 51	15851 0 663 46	15099 0.721 42	14419 0 783 38	13775 0 846 35	13179 0.913 33	12619 0.982 30			1.11 0.97 1.03	(.e.)
16008 0.506 51	15194 0 556 46	14446 0 608 42	13753 0.661 38	13126 0.718 35	12532 0 775 32	11982 0.837 30	11465 0.900 27	10981 0.965 25		1.11 0.97 1.03	Next Page.
14469 0.460 46	13725 0 505 42	13041 0.552 38	12407 0.261 34	11833 0 652 32	11289 0 705 29	10785 0 761 27	10311 0.818 25	9867 0.877 23	9453 0.939 21	1.11 0 97 1.03	on
→ 64 59		222	70100	67 69		32.1	-000	-20	3 2 7	104	Huued
14.4	15.1	15.8	16.5	17.1	17.8	18.5	19.2	19.9	20.6	Multiplying Factor	Table 20 Continued
21	81	23	24	25	26	27	28	53	30	Mult	(Table
					1.083						
				9	1.114						
				0	1.145	-		·			
				å	1.083						
				1	92XI/2						
				9	oraio						

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For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	О	ln.	0 438	0 469	0.500	0 531	0.563	0.594
ages (s in			2000					43720 0.607 146 181	41291 0.676 130
le see 1	flection			1800			44380 0.432 167 167	41667 0 487 147	39260 0.547 131	37069 0.609 117
is tab	oum De	1		0091		42083 0.337 168 173	39362 0.384 148	36945 0.433 130	34800 0.486 116	32847 0 541 104
n of th	Maxim s in Pot			1500	42335 0.276 181 174	39407 0.316 158	36853 0.360 138	34584 0.406 122	32570 0.455 109	30736 0 597 971
lanatic	ds, and Stresse			1400	39467 0.257 169 163	36731 0.295 147	34344 0.336 129	32223 0.379 114	30340 0.425 101	28625. 0.474 901
ıll exp	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Senare Inch as indicated.			13(4)	36599 0.239 157 157	34055 0.274 136	31835 0.312 119	29862 0 352 105	28110 0 395 94	26514 0 440 84
For fi	Loads inches, f		9	1200	33731 0 221 145 139	31379 0.253 126	29326 0 288 110	27501 0.324 97	25880 0.364 86	24403 0 406 77
	al Safe			1100	30863 0.202 132 128	28703 0.232 115	26817 0.264 101	25140 0.298 89	23650 0.334 79	22292 0 372 70
	Tota		0001	0001	27995 0 184 120 116	26027 0.211 104	24308 0 240 91	22779 0 271 80	21420 0 304 71	20181 0 338 64
	Refer-	Num- ber			-21254	-3504	-01004	- 0100	- 21224	- 01 03
	Ratio of Span to	Surfaced Timber	q/2		9 %	61 65	æ ×	10 5	=	11.7
	9	npdr		Ft.	4	5.	16	17	×	19
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			48 90			
	Section Modu- lus	bh2	Ф	In.3			602 06			
inued.	Moment of Inertia	bh³	13	ln.4			5870.11			
20-Continued.	Area Cross Section	Ar bh		Sq. In.			1 079			_
	Size	Surfaced S1S1E	or S4S	In.			94x194			
TABLE	SU.	Rough		ln.			10x20			_

						. ,					
0.625	0.656	0.688	0.719	0.750	0.781	0.813	0.844	0.875	906.0	0.938	
39182 0.749 118	37193 0.826 106	35424 0.907 97	33775 0.991 88								
35166 0.674 105	33371 0.743 95	31774 0.816 87	30285 0.892 79	28922 0.971 72	: : :						
31150 0.599 93	29549 0.661 84	28124 0.725 77	26795 0.793 70	25578 0.863 64	24473 0.937 59						
29142 0.562 88	27638 0.619 79	26299 0.680 72	25050 0.743 65	23906	22867 0.878 55	21889 0.950 51					
27134 0.524 82	25727 0.578 74	24474 0.635 67	23305 0.694 61	22234 0.755 56	21261 0.820 51	20345 0.887 47	19484 0.956 43				
25126 0.487 75	23816 0.537 68	22649 0.589 62	21560 0.644 56	20562 0.701 51	19655 0.761 47	18801 0.824 43	17998 0.888 40	17273 0.955 37			
23118 0.449 69	21905 0.496 63	20824 0.544 57	19815 0.595 52	18890 0.647 47	18049 0.703 43	17257 0.760 40	$\frac{16512}{0.820}$	15839 0.882 34	$15190 \\ 0.946 \\ 31$;e.)
21110 0.412 63	19994 0.454 57	18999 0.499 52	18070 0.545 47	17218 0.593 43	16443 0.644 39	15713 0.696 36	15026 0.752 33	14405 0.808 31	13806 0.867 29	13251 0.928 27	xt Pag
19102 0.375 57	18083 0.413 52	17174 0.454 47	16325 0.496 43	15546 0.539 39	14837 0.586 36	14169 0.633 33	13540 0.683 30	12971 0.735 28	12422 0.788 26	11913 0.843 24	on Ne
	-000	~ 01 m	-0100	200	- 01 co	-0100	0100	-00	02 00	- 67 69	tinued
15.3	12.9	13.5	14.2	14.8	15.4	16.0	16.6	17.2	17.8	18.5	(Table 20 Continued on Next Page.
20	21	22	23	24	25	26	27	58		30	(Table
				9	1.079	and the second second					
				90 609	1.107						
				000	1.135						
				и С							
				012-101	201020						
				10×90	77						

153

_										
For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	D	ln.	0.969	1.000		0.250	0 281	0.313
ages 6	:			2000			1.11			
le see 1	flection			1800	: : :		1.11° 0.97 1.03			30071 0.286 251 173
is tabl	um De			1600			1.11		29734 0.206 275 170	26691 0.254 222
n of th	Maxim s in Pou	ndicate		1500		: : ':	1.11	31401 0.153 327 180	27856 0.193 258	25001 0.238 208
lanatio	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stressen Pounds per	oquare inch, as indicated		1400			1.11 0.97 1.03	29289 0.142 305 168	25978 0.180 241	23311 0.222 194
ull exp	n Poun	luare II		1300		: : :	1.11 0.97 1.03	27177 0.132 283 156	24100 0.167 223	21621 0.207 180
For fi	Loads i	ž		1200			1 11 0.97 1.03	25065 0.122 261 144	22222 0.155 206	19931 0.191 166
	d Safe			0011	12729 0.991 25		0.97	22953 0.112 239 132	20344 0.142 188	18241 0.175 152
	Tota		000	1000	11434 0.901 22	10985 0.959 21	1.11	20841 0.102 217 120	18466 0.129 171	16551 0.159 138
	Refer-	Num- ber			-000	-10100	-04	H004	L01004	-004
	Ratio of Span to	Depth of Surfaced Timber	1/h		19.1	19.7	Multiplying	00	9 4	10.4
		Span		자	31	32	Mult	00	G.	10
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		1.679			34 90	
	Section Modu- lus	bh²	9	In.3		602.06			1.136	-
inued.	Moment of Inertia	bh³	12	In.4		1.135	_		1,185	and productions
20-Continued	Area Cross Section	A=bh		Sq. In.		1.079			132 25	
	Size	Surfaced	or S4S	In.		9½x19½			11½x1112	
TABLE	J.	Rough		ln.		10x20	l l		12x12	

0 344	0 375	0.406	0.438	0.469	0.500	0 531	0 563	0 594	0.625
30336 0.384 230 174	27761 0.458 193	25546 · 0 537 164	23651 0.623 141	1998 715 122	9562 813 107	19287 0.918 95			· · :
27264 3 0.346 0 207	24943 2 0 412 0 173	22946 2 0.483 0 147	21237 2 0 561 0 126	19746 21 0.643 0 110	18450 20 0.732 0.	17299 0.826 85	16270 0.927 75		
24192 2 0.307 0	22125 0,366 (20346 2 0.430 0	18823 2 0.498 (17494 1 0.572 0	16338 1 0.650 0 85	15311 1 0.734 0	14393 1 0.824 0 67	13571 0.917 60	
22656 0 288 172	20716 0.343 144	19046 0.403 122	17616 0.467 105	16368 1 0.536 (15282 0.610 80	14317 0.688 (70	13454 1 0.773 C	12683 1 0.860 0	0.953
21120 0.269 160	19307 0.320 134	17746 0 376 114	16409 0.436 98	15242 0.500 85	14226 0.569 74	13323 0.643 65	12515 0.721 58	11793 0 802 52	0.889 0.46
19584 0.250 148	17898 0.297 124	16446 0.349 105	15202 0.405 91	14116 0 465 78	13170 0.528 69	12329 0.597 60	11576 0.670 54	10903 0.745 48	10288 0.826 43
18048 0 231 137	16489 0 275 115	15146 0.322 97	13995 0.374 83	12990 0.429 72	12114 0.488 63	11335 0.551 56	10638 0 618 49	10013 0.688 44	9443 0.762 39
16512 0 211 125	15080 0.252 105	13846 0.295 89	12788 0.343 76	11864 0 393 66	11058 0.447 58	10341 0 505 51	9699 0.566 45	9124 0.631 40	8598 0.699 36
14976 0.192 113	13671 0.229 95	12546 0 268 80	11581 0.312 69	10738 0 358 60	10002 0.407 52	9347 0 459 46	8760 0.515 41	8234 0.573 36	7753 0.635 32
₩ 61 65 44	- 01 50	 01 m	01 50	c3 c5	222	-01 co	700	22.0	m,0100
11.5	12.5	13.6	14 6	15 7	16 7	17.7	18.8	19.8	20.9
=	21	22	#	61	16	17	81	19	20
				34.90	1.089				
				253.48	1.136				
				1457.51	1,185				
-		-		132 25	1.089				
				112x1113					
				2v12					

(Tuble 20 Continued on Next Page.)

f	*** * * * * * * * * * * * * * * * * * *		THE TARREST	17.7h	and the state of the state of		and the second second second second			
For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	ln.	0.656	0.688	0.719		0.281	0.313
pages 6	[]			2000		: : :		1.14 0.95 1.04		
le see	effection			1800		: : :		1.14 0.95		
his tab	num De	ਹ		1600				1.14 0.95 1.04		36854 0.216 263 180
on of tl	Maxir	ındıcate		1500				1.14 0.95 1.04		34525 0.203 247 169
lanati	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	oquare Inch, as indicated		1400	10537 0.981 42			1.14 0.95	35877 0.153 285 175	32196 0.189 230
ull exp	in Pour for Unit	quare m		1300	9732 0.911 39	9216 1.000 35		1.14 0.95 1.04	33288 0 142 264 163	29867 0 176 213
For f	Loads Inches,	Ω.	000	1200	8927 0.841 35	8448 0.923 32		1.14	30699 0.131 244 150	27538 0.162 197
	al Safe		9	200	8122 0.771 32	7680 0.846 29	7282 0.925 26	1.14 0.95	28110 0.121 223 138	25209 0.149 180
			1000	1000	7317 0.701 29	6912 0.769 26	6547 0.841 24	1.14	25521 0.110 203 125	22880 0.135 164
	Refer-	Num- ber			02 65	H0700	# 67 f5	104	→ c1 c3 44	1284
	Ratio of Span to	Depth of Surfaced Timber	q/2		21.9	23.0	24.0	Multiplying	8.0	8.8
		Span		Ft.	21	22	23	Mult	6	10
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.		34.90	1.089		40.97	1 082
	Section Modu- lus	bh²	9	In.3		253.48	1.136	1	349.31	1.122
inued.	Moment of Inertia	bh³	12	In.4		1457.31	1.185		2357.86	1.164
20-Continued	Area Cross Section	A=bh		Sq. In.	-	132.25	1.089		155.25	1 082
	.V.ize	Surfaced	or S4S	In.		112x113			113x133	
TABLE	7.	Rough		ln.	money p	12x12		1	12x14 1	

0.344	0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	0.625
	: : :	35288 0.457 194 173	32707 0 530 167	30446 0 608 145	28445 0 692 127	26704 0.781 112	25143 0.876 100	23722 0.976 89	
37655 0.295 245 184	34446 0.350 205	31706 0.412 174	29379 0 477 150	27349 0.547 130	25535 0.623 114	23964 0.703 101	22555 0.789	21272 0.879 80	20133 0.973 72
33421 0 262 217	30564 0 311 182	28124 0.366 155	26051 0.424 133	24234 0.486 115	22625 0.553 101	21224 0.625 89	19967 0.701 79	18822 0.781 71	17805 0.865 64
31304 0.245 203	28623 0.292 170	26333 0.343 145	24387 0.397 124	22681 0.456 108	21170 0.519 95	19854 0.586 83	18673 0.657 74	17597 0.732 66	16641 0.811 59
29187 0.229 190	26682 0.273 159	24542 0.320 135	22723 0 371 116	21128 0.426 101	19715 0.484 88	18484 0.547 78	17379 0.613 69	16372 0.684 62	15477 0.757 55
27070 0.213 176	24741 0.253 147	22751 0.297 125	21059 0.344 107	19575 0.395 93	18260 0.450 82	17114 0.508 72	16085 0.570 64	15147 0.635 57	14313 0 703 51
24953 0.196 162	22800 0.234 136	20960 0.274 115	19395 0 318 99	18022 0.365 86	16805 0.415 75	15744 0.469 66	14791 0.526 59	13922 0.586 52	13149 0.649 - 47
22836 0 180 148	20859 0.214 124	19169 0.251 105	17731 0.292 90	16469 0.334 78	15350 0.381 69	14374 0.430 60	13497 0.482 54	12697 0.537 48	11985 0.595 43
20719 0.164 135	18918 0.195 113	17378 0.228 95	16067 0.265 82	14916 0.304 71	13895 0.346 62	13004 0.391 55	12203 0.438 48	11472 0.488 43	10821 0.541 39
<u> 01 00 44</u>	-2180	-01004	307	- 626		- 67 69	02 65	-0.00	357
8.0	10.7	11.6	12.4	13.3	14.2	15.1	16.0	16.9	17.8
=	12	13	14	15	16	17	188	19	20
				40.97	1.082				
				349.31	1.122				
				2357.86	1.164				
				155.25	1.082				
				11½x13½					
				12x14					(Manage

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	Ω	In.	0.656	0.688	0.719	0.750	0.781	0.813	
pages	ns in			2000							1.12
le see	eflection			1800							1.12 0.96 1.04
his tak	num De	ರ		1600	16884 0.954 57						1.12 0.96
on of t	Maxin	indicate		1500	15775 0.895 54	14969 0.981 49					1.12
lanati	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	equare Inch, as indicated		1400	14666 0.835 50	13911 0 915 45					1.12
ull exp	in Poun for Unit	quare II		1300	13557 0.775 46	12853 0.850 42	12214 0.930 38				1.12 0.96 1.04
For f	Loads i	Ž		1200	12448 0.716 42	11795 0 785 38	11202 0.858 35	10659 0.934 32			1.12 0.96 1.04
	l Safe			1100	11339 0.656 39	10737 0.719 35	10190 0.787 32	9689 0.857	9226 0.929 26		1.12 0.96 1.04
	Tots			1000	10230 0.596 35	9679 0.654 31	9178 0.715 29	8719 0.779 26	8294 0 844 24	7894 0.914 22	1.12 0.96 1.04
	Refer-	Num- ber			-0100	-0100	-0100		-07:00	357	M 22 44
	Ratio of Span to	Depth of Surfaced Timber	1/h		18.7	19.6	20.4	21.3	22 2	23.1	Multiplying Factor
		Span		Ft.	21	22	23	24	25	26	Multij
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				1.082			
	Section Modu- lus	S bh2	90	In.3			,	349.31		~	
inued.	Moment of Inertia	bh ³	77	In.4				1.164		-	
20-Continued	Area Cross Section	A=bh		Sq. In.				155.25		-	
- 11	Size	Surfaced	OF 2543	in.		Non-contract		11½x13½			
TABLE	<i>17</i> 2	Rough		ln.				12x14			

0.344	0.375	0.406	0.438	0.469	0.500	0,531	0.563	0.594	0.625
		: : : :	43182 0,462 193 185	40234 0.530 168	37607 0.603 147	35301 0.681 130	33253 0.763 115	31426 0.850 103	29759 0.942 93
		41587 0.358 201 179	3879× 0.416 173	36140 0.477 151	33771 0.543 132	31691 0.613 117	29843 0.687 104	28194 0.765 93	26689 0.848 83
	40380 0.271 210 172	37165 0.318 179	34414 0.370 154	32046 0.424 134	29935 0.483 117	28081 0.545 103	26433 0.611 92	24962 0.680 82	23619 0.754 74
41348 0.214 235 176	37821 0.254 197	34804 0.299 167	32222 0.347 144	29999 0.398 125	28017 0.453 110	26276 0.511 97	24728 0.572 86	23346 0.637 77	22084 0.706 69
38557 0.200 219 164	35262 0.237 184	32443 0.279 156	30030 0.324 134	27952 0.371 116	26099 0.422 102	24471 0.477 90	23023 0.534 80	21730 0.595 72	20549 0.659 64
35766 0.185 203 153	32703 0.221 170	30082 0.259 145	27838 0.300 124	25905 0.345 108	24181 0.392 94	22666 0.443 83	21318 0.496 74	20114 0.552 66	19014 0.612 59
32975 0.171 187 141	30144 0.204 157	27721 0.239 133	25646 0.277 115	23858 0.318 99	22263 0.362 87	20861 0.409 77	19613 0 458 68	18498 0.510 61	17479 0.565 55
30184 0.157 171 129	27585 0.187 144	25360 0.219 122	23451 0 254 105	21811 0.292 91	20345 0.332 80	19056 0.375 70	17908 0.420 62	16882 0.468 56	15944 0.518 50
27393 0.143 156 117	25026 0.170 130	22999 0.199 111	21262 0.231 95	19764 0.265 82	18427 0.302 72	17251 0.341 63	16203 0.382 56	15266 0.425 50	14409 0.471 45
- 00 m	02 to 4	H01004	-01004	-08	351	67 69	H 67 60	357	
00 20	6 6	10.1	10 8	11 6	12.4	13.2	13.9	14.7	15.5
Ħ	2	13	14	15	16	17	18	19	20
				1.077					
-				1.111					
				1.148	_				
				178.25 3		,			
				11½x15½					•
				12x16 1					

(Table 20 Continued on Next Page.)

Deflec-tion equiv-alent to 1/32 Inch per Foot of Span For full explanation of this table see pages 68 to 70. 0.656 0.688 0.719 0.750 813 844 781 In. 0 2000 E. Total Safe Loads in Pounds, and Maximum Deflections 25328 0.935 75 1800 Inches, for Unit Stresses in Pounds per 22404 0.831 67 21285 0.912 60 20278 0.997 55 1600 Square Inch, as indicated 20942 0.779 62 19890 0.855 57 18943 0.935 51 1500 19480 0.728 58 18495 0.798 53 17608 0.872 48 16777 1400 18018 0.676 54 0.741 16273 0 810 44 15498 0.882 40 0.958 1300 16556 0.624 49 15705 0.684 45 14219 0.814 37 14938 0 748 41 13560 0.884 34 12949 1200 14310 0.627 41 15094 0.572 45 13603 0.686 37 12940 0.746 34 12332 0.811 31 11768 0.876 28 11237 0.945 26 1100 13632 0.520 41 12915 0.570 37 12268 0.623 33 11661 0.679 30 11104 0.737 28 10100 0.859 23 000 10587 0.796 25 Refer-ence Num-ber -0300 - 00 00 -0700 - C1 00 -00 -00 Surfaced Depth Span Timber 9 0 00 9 1/h 5 17. 18. 19 20. Span 24 26 Weight per Lineal Foot (Based Timber at 38 lbs. per cu. ft.) on Green 47.03 Lbs. 077 Section Modu-460.48 lus In.3 1.11 9 Moment 3568.72 -Continued Inertia bh^3 1.148 In.4 Area Cross Section A==bh 178.25 077 S.d. 20-Surfaced S1S1E or S4S 113x152 In. CABLE Size Rough 12x16 In.

0.875		0.375	0.406	0.438	0.469	0.500	0.531	0.563	0.594	
	0.97	* 1 *				48090 0.534 167 182	45117 0.603 148	42524 0.676 131	40191 0.753 118	
	0.97			: : :	46184 0.423 171 171	43196 0.481 150	40515 0.543 132	38176 0.609 118	36071 0.678 105	
	1.11 0.97 1.03		47486 0.282 203 180	44009 0.327 175	40964 0.376 152	38302 0.427 133	35913 0.482 117	33828 0.541 104	31951 0.603 93	
	0.97	48278 0.225 223 182	44475 0.265 190	41212 0.307 164	38354 0.352 142	35855 0.401 125	33612 0.452 110	31654 0.507 98	29891 0.565 87	
	1.11 0.97 1.03	45017 0.210 208 170	41464 0.247 177	38415 0.287 153	35744 0.329 132	33408 0.374 116	31311 0.422 102	29480 0.473 91	27831 0.527 81	
	1.11 0.97 1.03	41756 0.195 193 158	38453 0.229 164	35618 0.266 141	33134 0.305 123	30961 0.347 108	29010 0.392 95	27306 0.440 84	25771 0.490 75	
	1.11 0.97 1.03	38495 0.180 178 146	35442 0.212 152	32821 0.246 130	30524 0.282 113	28514 0.321 99	26709 0.362 87	25132 0.406 78	23711 0.452 69	-
	1.11 0.97 1.03	35234 0.165 163 134	32431 0.194 139	30024 0.225 119	27914 0.258 103	26067 0.294 91	24408 0.332 80	22958 0.372 71	21651 0.414 63	9 1
9643 0.923 22	1.11 0.97	31973 0.150 148 122	29420 0.176 126	27227 0.205 108	25304 0.235 94	23620 0.267 82	22107 0.301 72	20784 0.338 64	19591 0.377 57	
63 60	□014	-01004	- 67 65 4		1004		H 67 69	- 67 89		
21.7	Multiplying Factor	2.2	8.9	9.6	10.3	11.0	11.7	12.3	13.0	0
28	Multi	12	13	14	15	16	17	8	19	1
					53.10					
					586.98					
					5136.07					
					201.25	5				
					11½x17½					The second second
					12x18					

(Table 20 Continued on Next Page.)

to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	D	Ju.	0.625	0.656	0.688	0.719	0.750	0.781	0.813
For full explanation of this table see pages 68 to 70.				2000	38058 0.834 106	36165 0.920 96				: : :	
e see 1	flections			1800	34146 0 751 95	32437 0.828 86	30872 0.909 78	29415 0 994 71		: : :	
is tabl	num De	77		1600	30234 0.668 84	28709 0 736 76	27312 0.808 69	26011 0 884 63	24822 0.961 57		
n of th	Maxim s in Pou	ndicate		1500	28278 0.626 79	26845 0 690 71	25532 0.758 65	24309 0.829 59	23191 0.901 54	22162 0.979 49	
lanatic	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per	Square Inch, as indicated		1400	26322 0.584 73	24981 0.644 66	23752 0.708 60	22607 0.773 55	21560 0.841 50	20596 0 914 46	19689 0.987 42
ull exp	in Pour	quare In		1300	24366 0.543 68	23117 0.598 61	21972 0.657 56	20905 0.718 51	$\frac{19929}{0.781}$	19030 0 848 42	18184 0.917 39
For f	Loads Inches,	2		1200	22410 0.501 62	21253 0 552 56	20192 0.606 51	19203 0.663 46	18298 0.721 42	17464 0 783 39	16679 0.846 36
	al Safe			1100	20454 0.459 57	19389 0.506 51	18412 0.556 47	17501 0.608 42	16667 0.661 39	15898 0 718 35	15174 0.775 32
				1000	18498 0 417 51	17525 0.460 46	16632 0.505 42	15799 0.552 38	15036 0.601 35	14332 0 652 32	13669
	Refer-	ence Num- ber			200	- 63 65			32	-26	200
	Ratio of Span to	Depth of Surfaced Timber	l/h		13.7	14.4	15.1	15.8	16.5	17.1	17.8
		Span		Ft.	50	21	22	23	24	25	26
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			4	53 10		n.t.	-
	Section Modu- lus	S= bh²	9	In.3			,	586 98			
nued.	Moment of Inertia	bh³	77	In.4		Ports		5136 07 1 136			
20—Continued	Area Cross Section	A=bh		Sq. In.				201 25 8			
	Size	Surfaced	OF 343	In.	-			112x172			
TABLE	0.	Rough		ln.				12x18 1			

0.844	0.875	906.0	0.938		0.438	0.469	0.500	0.531	
				1.10					
	: :		: :	1.10 0.97 1.03			53737 0.432 168 183	50456 0.487 149	
				1.10		50952 0.337 170 173	47661 0.384 149	44738 0.433 132	
				1.10 0.97 1.03	51236 0.276 183 174	47712 0 316 159	44623 0.360 140	41879 0.406 123	
			: : :	1 10 0.97 1.03	47765 0 257 171 163	44472 0.295 148	41585 0.336 130	39020 0.379 115	
17416 0 989 36			: :	1.10 0.97 1.03	44294 0.239 158 151	41232 0.274 137	38547 0.312 121	36161 0.352 106	
15966 0 913 33	15290 0.982 30			1 10 0.97 1.03	40823 0 221 146 139	37992 0.253 127	35509 0.288 111	33302 0.324 98	
14516 0 837 30	13892 0.900 28	13310 0 965 26		1 10 0.97 1.03	37352 0.202 133 128	34752 0.232 116	32471 0.264 101	30443 0.298 90	3
13066 0.761 27	12494 0.818 25	11960 0 877 23	11456 0 939 21	1.10	33881 0.184 121 116	31512 0.211 105	29433 0.240 92	27584 0.271 81	
67 66	01 00	- 01 60	H 51 65	- C 4	-0004	-0.64	-004	-0.00	
18 5	19 2	19 9	20.6	Multiplying Factor	9 %	6.	9.8	10.5	
72	28	53	30	Mult	41	15	16	17	
		53.10			[} 	59.19			
		586.98			[!1	728.81			
_	,	5136.07 1.136				7105.93	2		
		201.25				224.25			
		112x173				11½x19½			
		12x18]	12x20			

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70. TABLE 20-Continued.

1	j •		1						
Deflec- tion equiv- alent to 1/32	Foot of Span	D	In.	0.563	0.594	0.625	0.656	0.688	0.719
			2000	52935 0.607 147 181	50035 0.676 132	47416 0.749 119	45017 0.826 107	42878 0.907 97	40879 0.991 89
Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated			1800	47535 0.547 132	44919 0.609	42556 0.674 106	40391 0.743 96	38460 0.816 87	36655 0.892 80
Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Square Inch, as indicated			1600	42135 0.486 117	39803 0.541 105	37696 0.599 94	35765 0.661 85	34042 0.725	32431 0.793 71
in Pounds, and Maxim, for Unit Stresses in Pou			1500	39435 0.455 110	37245 0.507 98	35266 0.562 88	33452 0.619 80	31833 0.680 72	30319 0.743 66
ds, and Stresse nch, as i			1400	36735 0.425 102	34687 0.474 91	32836 0.524 82	31139 0.578 74	29624 0.635 67	28207 0 694 61
in Pour for Unit			1300	34035 0.395 95	32129 0.440 85	30406 0.487 76	28826 0.537 69	27415 0.589 62	26095 0.644 57
Loads Inches,			1200	31335 0.364 87	29571 0.406 78	27976 0.449 70	26513 0.496 63	25206 0.544 57	23983 0.595 52
al Safe			4100	28635 0.334 80	27013 0.372 71	25546 0.412 64	24200 0.454 58	22997 0.499 52	21871 0.545 48
		9	1000	25935 0.304 72	24455 0.338 64	23116 0.375 58	21887 0.413 52	20788 0.454 47	19759 0.496 43
Refer-				-0004	- 22 60	-0100	- 21 60	-0.00	~00
Ratio of Span to Depth	Surfaced Timber	q/ ₂		11.1	11.7	12.3	12.9	13.5	14.2
Span			Ft.	188	19	20	21	22	23
Weight per Lineal Foot (Based on	Timber at 38	lbs. per cu. ft.)	Lbs.			59 19			
Section Modu- lus	S	Q	In.3			728 81 1.097			
Moment of Inertia	I=-	12	In.4			7.105.93			
Area Cross Section	A=bh		Sq. 1n.			1.070			
Size	Surfaced	OF CARO	In.			112x192			
<i>v.</i>	Rough		In.		_	12x20 1			

					_				****
0.750	0.781	0.813	0.844	0.875	906.0	0.938	696.0	1.000	
									1.10
35011 0.971 73									1.10 0.97 1.03
30963 0.863 65	29624 0.937 59								1.10 0.97 1.03
28939 0.809 60	27680 0.878 55	26496 0.950 51							1.10 0.97 1.03
26915 0.755 56	25736 0.820 52	24627 0.887 47	23601 0.956 44						1.10 0.97 1.03
24891 0.701 52	23792 0.761 48	22758 0 824 44	21801 0.888 40	20911 0.955 37					1.10 0.97 1.03
22867 0.647 48	21848 0.703 44	20889 0.760 40	20001 0.820 37	19175 0.882 34	18396 0.946 32				1.10 0.97 1.03
20843 0.593 43	19904 0.644 40	19020 0.696 37	18201 0.752 34	17439 0.808 31	16720 0.867 29	16044 0.928 27	15413 0.991 25		1.10 0.97 1.03
18819 0.539 39	17960 0.586 36	17151 0.633 33	16401 0.683 30	15703 0.735 28	15044 0.788 26	14424 0.843 24	13845 0.901 22	13926 0.959 21	1.10
357	400	-0.00	-00	32	357	- 62 %	- 67 69	322	1 2 4
14.8	15.4	16.0	16.6	17.2	17.8	18.5	19.1	19.7	Multiplying Factor
24	25	26	27	. 00	29	30	31	32	Mult Fa
				59.19	1.070				
				728.81	1.097				
				7105.93	1.126	_			
				224.25	1.070				
				112x193					
				12x20	,				

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	D	ln.	0.281	0 313	0.344	0.375	0 406	0.438
pages (2000					41415 0.457 195 173	38367 0.530 168
le see	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per			1800			44183 0.295 246 184	40427 0.350 206	37211 0.412 175	34463 0.477 151
nis tab	num De	=		1600		43231 0.216 265 180	39215 0.262 218	35871 0.311 183	33007 0.366 155	30559 0.424 134
n of th	Maxin s in Pou	nareare		1500		40499 0.203 248	36731 0 245 204	33593 0.292 171	30905 0.343 146	28607 0 397 125
lanatio	ds, and Stresse	Cu, 43 1		1400	42085 0.153 286 175	37767 0.189 231	34247 0.229 191	31315 0.273 160	28803 0.320 136	26655 0 371 117
ıll exp	in Pounds, and Maxim for Unit Stresses in Pou	Train I	0	1300	39048 0.142 266 163	35035 0.176 215	31763 0.213 177	29037 0.253 148	26701 0 297 126	24703 0 344 108
For fi	Ioads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per	5	000	1200	36011 0.131 245 150	32303 0.162 198	29279 0.196 163	26759 0.234 137	24599 0 274 116	22751 0.318 100
	al Safe		9	0011	32974 0.121 224 138	29571 0.149 181	26795 0.180 149	24481 0.214 125	22497 0 251 106	20799 0.292 91
	Tota		0001	1000	29937 0.110 204 125	26839 0.135 164	24311 0 164 135	22203 0.195 113	20395 0.228 96	18847 0.265 82
	Refer-	Num- ber			62 60 44°		≥10100 4 4	-1000	-0.64	3.6
	Ratio of Span to	of Surfaced Timber	1/h		8.0	8.9	8 6	10.7	11 6	12 4
		прац		Ft.	Φ.	10	=	12	£	14
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			48 10			
	Section Modu- lus	S=S	9	In.3			410 06			
nued.	Moment of Inertia	bh³	12	In.4			2767 93			
-Continued	Area Cross Section	A==bh		Sq. In.			182 25 2767 93			
20	Size	Surfaced	OF 242	In.			14x14 132x133			
TABLE	<i>Ø</i> 2	Rough		In.			14x14		-	

.469	500	531	.563	594	625	.656	688	719	750	781
0	0	0	0	0	0	0	0	0	0.	0
35698 0.608 146	33391 0.692 128	31342 0.781 113	29514 0.876 100	27866 0.976 90						
32056 0.547 131	29975 0.623 115	28126 0.703 101	26476 0.789 90	24988 0.879 80	23626 0 973 72					
28414 0.486 116	26559 0.553 102	24910 0.625 90	23438 0.701 80	22110 0.781 71	20894 0.865 64	19806 0.954 58				
26593 0.456 109	24851 0 519 95	23302 0.586 84	21919 0 657 75	20671 0.732 67	19528 0.811 60	18505 0.895 54	17572 0.981 49			
24772 0.426 101	23143 0.454 89	21694 0.547 78	20400 0.613 69	19232 0.684 62	18162 0.757 56	17204 0.835 50	16330 0.915 45			
22951 0.395 94	21435 0.450 82	20086 0.508 72	18881 0.570 64	17793 0.635 57	16796 0.703 51	15903 0.775 46	15088 0.850 42	14338 0.930 38		
21130 0 365 86	19727 0.415 75	18478 0 469 67	17362 0.526 59	16354 0.586 53	15430 0.649 47	14602 0.716 43	13846 0.785 39	13150 0.858 35	12514 0.934 32	
19309 0.334 79	18019 0.381 69	16870 0.430 61	15843 0.482 54	14915 0.537 48	14064 0.595 43	13301 0.656 39	12604 0.719 35	11962 0.787 32	11375 0.857 29	10821 0.929 27
17488 0.304 71	16311 0.346 62	15262 0.391 55	14324 0.438 49	13476 0.488 43	12698 0.541 39	12000 0.596 35	11362 0.654 32	10774 0.715 29	10236 0.779 26	9728 0.844 24
-0100	-0100	357	-6360	- 2 6	~0.00	C7 60	325	-26	126	357
13 3	2 41	15.1	16.0	16.9	17.8	18.7	19.6	20.4	21.3	22.2
15	16	17	18	19	20	21	22	-53	24	25
				<u> </u>	07.10				-	
	-				1.0					
				410 06	1.115					
	~~ ~			S	99		-			
				1976						
				601	1.075					
					102X103		-			
					#XX#					

(Table 20 Continued on Next Page.)

8 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	Q	ln.	0.813		0.344	0.375	0.406	0.438
For full explanation of this table see pages 68 to 70.				2000		1.12				50727 0.462 194 185
le see]	flection			1800		1.12 0.96 1.04			49178 0.358 203 179	45577 0.416 174
is tab	num De	r.		1600		1.12		47402 0.271 212 172	43634 0.318 180	40427 0.370 155
on of th	Maxin s in Pou	naicate		1500		1.12 0.96 1.04	48578 0.214 236 176	44398 0.254 198	40862 0.299 168	37852 0.347 145
lanatio	ds, and Stresse	ich, as i		1400		1.12	45299 0.200 221 164	41394 0.237 185	38090 0.279 157	35277 0.324 135
ull exp	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stress in Pounds per	oquare tuch, as indicated		1300		1.12 0.96 1.04	42020 0.185 205 153	38390 0.221 171	35318 0.259 146	32702 0.300 125
For f	Loads Inches, I	Q.	0	1200		1.12 0.96	38741 0.171 189 141	35386 0.204 158	32546 0.239 134	30127 0.277 115
	al Safe		7	0011		1.12 0.96	35462 0.157 173 129	32982 0.187 147	29774 0.219 123	27552 0.254 105
			0	990	9260 0.914 22	1.12 0.96 1.04	32183 0.143 157 117	29378 0.170 131	27002 0.199 111	24977 0.231 96
	Refer-	Num- ber			H 63 69	-04	1004	H01004	H 61 60 44	H01004
	Ratio of Span to	Depth of Surfaced Timber	q/2		23.1	Multiplying Factor	80 73.	9.3	10.1	10.8
		usda		Ft.	26	Mult	=	12	13	14
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.	48.10	1.075		55.20	1.070	
	Section Modu- lus	S	9	In.8	410.06	1.115		540.56	1.105	
inued.	Moment of Inertia	bbs I	12	In.4	2767.93	1.156		4189.37	1.141	
20-Continued	Area Cross Section	A=bh		Sq. In.	182.25	1.075		209.25	1.070	
	Size	Surfaced	or of	In.	13½x13½			13½x15½		
TABLE	72	Rough		ln.	14x14			14x16		

0.469	0.500	0.531	0.563	0.594	0.625	0.656	0.688	0.719	0.750	0.781
47212 0.530 169	44157 0.603 148	41462 0.681 131	39046 0.763 116	36891 0.850 104	34936 0.942 94					
42408 0.477 152	39653 0.543 133	37222 0.613 117	35042 0.687 104	33097 0.765 93	31332 0.848 84	29728 0.935 76				
37604 0.424 134	35149 0.483 118	32982 0.545 104	31038 0.611 92	29303 0.680 83	27728 0.754 74	26296 0.831 67	25009 0.912 61	23818 0.997 55		
35202 0.398 126	32897 0 453 110	30862 0.511 97	29036 0.572 86	27406 0.637 77	25926 0.706 69	24580 0.779 63	23370 0.855 57	22250 0.935 52	- : :	
32800 0.371 117	30645 0 422 103	28742 0.477 91	27034 0.534 80	25509 0.595 72	24124 0.659 65	22864 0.728 58	21731 0.798 53	20682 0.872 48	19717 0.950 44	
30398 0 345 109	28393 0.392 95	26622 0.443 84	25032 0.496 75	23612 0.552 67	22322 0.612 60	21148 0.676 54	20092 0.741 49	19114 0.810 45	18214 0.882 41	17366 0.958 37
27996 0.318 100	26141 0.362 88	24502 0 409 77	23030 0.458 69	21715 0.510 61	20520 0.565 55	19432 0.624 50	18453 0.684 45	17546 0.748 41	16711 0.814 37	$\frac{15924}{0.884}$
25594 0.292 91	23889 0.332 80	22382 0.375	21028 0.420 63	19818 0.468 56	18718 0.518 50	17716 0.572 45	16814 0.627 41	15978 0.686 37	15208 0.746 34	14482 0.811 31
23192 0.265 83	21637 0.302 72	20262 0.341 64	19026 0.382 57	17921 0.425 51	16916 0.471 45	16000 0.520 41	15175 0.570 37	14410 0.623 34	13705 0.679 31	13040 0.737 28
-0160	-000	₩ 01 CO	-0100	-0100	H 07 00			-00	⇔ 63€	H 67 69
11.6	12.4	13.2	13.9	14.7	15.5	16.3	17.0	17.8	18.6	19.4
15	16	17	18	19	20	21	22	23	24	25
				55.20	1.070					
				540.56	1.105					
				4189.37	1.141					
				209.25	1.070					
				134x154						
				14x16						

(Table 20 Continued on Next Page.)

1		-						Market Market Market Contract		a w manage	
For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	D	l a	0.813	0.844	0.875		0.375	0.406	0.438
pages	is in			2000				1.11 0.97 1.03			
le see	effection			1800				1.11			
his tat	num Do	P		1600				1.11 0 97 1 03		55718 0 282 204 180	
on of t	Maxir S in Pou	indicate		1500				1.11 0 97 1 03	56672 0.225 225 182	52185 0.265 191	48343 0.307 164
olanati	nds, and	ach, as j		1400		-		1.11 0 97 1 03	52844 0.210 210 170	48652 0 247 178	45062 0.287 153
'ull exp	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per	Square Inch, as indicated		1300				1 11 03	49016 0.195 195 158	45119 0 229 165	41781 0.266 142
For 1	Loads Inches,	22		0021	15197 0.956 31		: : :	1.11	45188 0.180 179 146	41586 0.212 152	38500 0.246 131
	al Safe			1100	13811 0.876 28	13205 0 945 26		1.11	41360 0.165 164 134	38053 0.194 139	35219 0.225 120
				1000	12425 0.796 26	11869 0 859 24	11334 0.923 22	1.11 6 97 1 03	37532 0.150 149 122	34520 0.176 127	31938 0.205 109
	Refer-	Num- ber			7000	C1 50	200	-c14	-0169	- 01 00 44	H 62 60
	Ratio of Span to	Depth of Surfaced Timber	1/h		20.1	20 9	21.7	Multiplying Factor	2.2	o.	9.6
		Span		Ft	26	75	788	Multi	12	<u> </u>	14
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cut. ft.)	Lbs.		55 20	1.070			1.066	
	Section Modu- lus	S	٥	In 3		540.56	1.105	_		90 6×9 1 096	-
inued.	Moment of Inertia	1=1	77	Ln.1		4189-37	1.141		-	1 128	-
-Continued	Area Cross Section	A=bh		.Sq. In.		209 25 4189 37	1.070			1 066	-
SLE 20	Nize	Surfaced S1S1E	03.63	In.		132x152		, ''		132x172	
TABLE	,	Rough		In.		14x16				14818	
					_						

.469	500	531	.563	.594	625	.656	. 688	.719	.750
0	C	0.	Ć.	0	0	0	0	0	0.
	56423 0.534 168 182	52981 0 603 148	49898 0 676 132	47176 0.753 118	44694 0 834 106	42451 0.920 96			
54163 0.423 172 175	50681 0.481 151	47577 0.543 133	44796 0.609 119	42340 0.678 106	40100 0.751 95	38075 0.828 86	36231 0.909 78	34513 0.994 71	
48041 0.376 153	44939 0.427 134	42173 0 482 118	39694 0 541 105	37504 0.603 94	35506 0.668 85	33699 0.736 75	32053 0.808 69	30519 0.884 63	29128 0 961 58
44980 0.352 143	42068 0.401 125	39471 0.452 111	37143 0.507 98	35086 0 565 88	33209 0.626 79	31511 0.690 71	29964 0.758 65	28522 0.829 59	27214 0.901 54
41919 0.329 133	39197 0.374 117	36769 0.422 103	34592 0.473 91	32668 0.527 82	30912 0.584 74	29323 0.644 67	27875 0.708 60	26525 0.773 55	25300 0.841 50
38858 0.305 123	36326 0 347 108	34067 0.392 95	32041 0.440 85	30250 0.490 76	28615 0.543 68	27135 0.598 62	25786 0.657 56	24528 0.718 51	23386 0.781 46
35797 0.282 114	33455 0.321 100	31365 0.362 88	29490 0.406 78	27832 0.452 70	26318 0.501 63	24947 0.552 57	23697 0.606 51	22531 0.663 47	21472 0.721 43
32736 0.258 104	30584 0.294 91	28663 0 332 80	26939 0.372 71	25414 0.414 64	24021 0.459 57	22759 0.506 52	21608 0.556 47	20534 0.608 43	19558 0.661 39
29675 0 235 94	27713 0 267 83	25961 0 301 73	24388 0.338 65	22996 0.377 58	21724 0.417 52	20571 0.460 47	19519 0.505 42	18537 0.552 38	17644 0.601 35
-0.64	-0.004	- 01 th	200	327	22 5	H 07 60	- 28	22.5	352
10.3	11 0	11 7	12.3	13.0	13.7	14.4	15.1	15.8	16.5
151	16	17	18	. 61	20	21	22	23	24
				62.33					
	•	_		96.06					,
			-	6029.30 1.128					
				1.066					
				132x17 2					
				4x18 1					

(Table 20 Continued on Next Page.)

TABLE 20—Continued. Size	-											
Size Area Account	38 to 70.	Deflec- tion cquiv- alent	lnch per Foot of Span	D	lo.	0.781	0.813	0.844	0.875	0.906	0.938	
Size	ages (2000			: : :	: : :	: : :		1.10
Size	e see p	fections			1800						: : :	
Size	is tabl	um Dei ads per			1600			: : :	: : :		: : :	
Size	a of th	Maxim in Pour	Idicated		1500	25997 0 979 50			• : : :			
Size	anation	is, and Stresses	in, a.s in		1400	24160 0.914 46	23104 0.987 42					
Size	ll expl	Pound r Unit	uare Inc			22323 0.848 43						
Size Area Moment Section Weight Span Order Span Spa	For fu	loads in	DZ DZ	_	1200			18729 0.913 33	17947 0.982 31			
Size Area Moment Section Weight Span Order Span Spa		Safe I			1100	18649 0 718 36	17806 0.775 33	17028 0.837 30				
Size		Tota			1000		16040 0 705 29	15327 0.761 27				
Size		Refer-	Num- ber									
Size Area Moment Section Weight Size Cross Ordinaria Modu- Lineal Section Cross Ordinaria Modu- Lineal Section Cross Cross Ordinaria Cross Ordinaria Cross Ordinaria O		Ratio of Span to	Depth of Surfaced Timber	4/л		17.1					20.6	ying
Size Area Moment Section Cross of Social Incrtia Institute Inc. Sq. In. In. Sq. In. In. In. In. In. In. In. In. In. In		7			Ft.	25	26	27	28	29	30	Multip
Size Area Monent Cross Inertia Sizie Cross Inertia Surfaced A=bh 1=20		Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				62.33			
Size Area Moment Size Section Inertia Size Section Inertia or S4S A=bh 1= 12		Section Modu- lus	bh²	ω	In.3				689.06 1.096			
A B	nued.	Moment of Inertia	l=	12	In.4		- <u></u>					——
Size Rough Surfaced Surfaced Surfaced In. In. 14x18 133x173	Conti	Area Cross Section	A=bh		Sq. In.							
Rough In. 114x18	LE 20	ize	Surfaced	OF 545	ln.							
	TAB	60	Rough		In.							

0.438	0.469	0.500	0,531	0,563	0.594	0.625	0.656	0.688	
				62130 0.607 148 181	58700 0.676 132	55631 0.749 119	52841 0.826 108	50291 0.907 98	
		63005 0.432 169 183	59173 0.487 149	55792 0.547 133	52698 0.609 119	49929 0.674 107	47411 0.743 97	45109 0.816 88	
	59774 0.337 171 173	55881 0.384 150	52467 0.433 132	49454 0.486 118	46696 0.541 105	44227 0.599 95	41981 0.661 86	39927 0.725 78	
60123 0.276 184 174	55973 0.316 160	52319 0.360 140	49114 0.406 124	46285 0.455 110	43695 0.507 99	41376 0.562 89	39266 0.619 80	37336 0.680 73	
56050 0.257 172 163	52172 0.295 149	48757 0.336 131	45761 0.379 115	43116 0.425 103	40694 0.474 92	38525 0.524 83	36551 0.578 75	34745 0.635 68	
51977 0.239 159 151	48371 0.274 138	45195 0.312 121	42408 0.352 107	39947 0.395 95	37693 0.440 85	35674 0.487 76	33836 0.537 69	32154 0.589 63	
47904 0.221 147 139	44570 0.253 127	41633 0.288 112	39055 0.324 98	36778 0.364 88	34692 0.406 78	32823 0.449 70	31121 0.496 64	29563 0.544 58	
43831 0.202 134 128	40769 0.232 116	38071 0.264 102	35702 0.298 90	33609 0.334 80	31691 0.372 71	29972 0.412 64	28406 0.454 58	26972 0.499 53	
39758 0.184 122 116	36968 0.211 106	34509 0.240 92	32349 0.271 82	30440 0.304 73	28690 0.338 65	27121 0.375 58	25691 0.413 52	24381 0.454 48	;
-01004	=01234	₩ C1 80 44	322	H01004	H 67 89	c7 co	322	700	,
8.6	9.2	8.6	10.5	11.1	11.7	12.3	12.9	13.5	-
14	15	16	17	200	19	20	21	22	
			60 45	1.064					
			855 56	1.091					
	_		8341 74	1.118					
			263. 25						
			13±x19;						
-			14x20						

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deffection equivalent to 1/32	Inch per Foot of Span	Q	ln.	0.719	0.750	0.781	0.813	0.844	0.875	906.0
pages 6	.9		0000	2000	48002 0.991 89						
le see	flection		000	1800	43042 0.892 80	41119 0.971 73				i . :	
is tab	num De inds per		000	1000	38082 0.793 71	36365 0_863 65	34760 0.937 60		: .		
n of th	Maxin s in Pou		0 2	nnet	35602 0.743 66	33988 0.809 61	32479 0.878 56	31074 0.950 51			
lanatic	ds, and Stresse		1400	1400	33122 0 694 62	31611 0.755 56	30198 0.820 52	28882 0.887 48	27665 0 956 44	:	
ıll exp	Total Safe Loads in Pounds, and Maximum Deflections Inches, for Unit Stresses in Pounds per Souare Inch as indicated		1900	noet	30642 0 644 57	29234 0.701 52	27917 0 761 48	26690 0.824 44	25555 0.888 41	24536 0 955 38	
For fu	Loads i nches, f		1000	1200	28162 0 595 52	26857 0.647 48	25636 0.703 44	24498: 0.760 40	23445 0.820 37	22499 0.882 34	21579 0 946 32
	Il Safe		1100	2011	25682 0 545 48	24480 0.593 44	23355 0 644 40	22306 0.696 37	21335 0.752 34	20462 0 808 31	19613 0.867 29
	Tota		1000	0001	23202 0.496 43	22103 0.539 39	21074 0.586 36	20114 0.633 33	19225 0 683 31	18425 0.735 28	17647 0.788 26
	Refer-	Num- ber			-200	- 0100	- 21 55	- 54 55	- 01 00	H 64 55	67 65
	Ratio of Span to	of Surfaced Timber	ч/1		14 2	14.8	15.4	16.0	16 6	17.2	17.8
	20	ngor co		Ft.	23	24	2.5	26	27	28	2.9
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				1 064			
	Section Modu- lus	bh²	9	In.3				855 56			
nued.	Moment of Inertia	Phs I	12	Jn.4			-	1.118			
-Continued	Area Cross Section	Abh		Sq. ln.				263.25 ×			
TABLE 20-	ize e	Surfaced	or S4S	In.	-			14x20 13½x19½			
TAB	4	Rough		In.				14x20			

0.938	696 0	1 000		0.344	0 375	0 406	0 438	0.469	0.500	
	: : :	i :	1 09 0 97 1.03				58232 0.462 195 185	54229 0.530 170	50726 0.603 149	
: : :	:	. : .	1 09 0 97 1 03	: : :		56452 0 358 204 179	52320 0.416 175	48711 0.477 152	45552 0 543 133	
: :			1 09 0 97 1 03		54423 0 271 213 172	50088 0 318 181	46408 0.370 155	43193 0.424 135	40378 0.483 118	
			1 09 0 97 1 03	55718 0 214 237 176	50974 0 254 199	46906 0.299 169	43452 0.347 146	40434 0.398 126	37791 0.453 111	
			1 09 0.97 1 03	51957 0.200 221 164	47525 0.237 186	43724 0.279 158	40496 0.324 136	37675 0.371 118	35204 0.422 103	
			1.09	48196 0.185 205 153	44076 0.221 172	40542 0 259 146	37540 0.300 126	34916 0.345 109	32617 0.392 96	
	į . i		1 09 0 97 1 03	44435 0 171 189 141	40627 0 204 159	37360 0.239 135	34584 0.277 116	32157 0.318 101	30030 0.362 88	ge.)
18828 0.928 27	18088 0 991 25	- :	1 09 0 97 1.03	40674 0.157 173 129	37178 0.187 145	34178 0.219 123	31628 0.254 106	29398 0.292 92	27443 0.332 80	xt Pag
16927 0.843 24	16248 0.901 22	15598 0.959 21	1 09 0 97 1 03	36913 0.143 157 117	33729 0 170 132	30996 0.199 112	28672 0.231 96	26639 0.265 83	24856 0.302 73	on Ne
- 21 52	₩ 53 60	21 25	61 4	1-0004	0100 -1	-0184	-0.84	- 61 69	-200	tinned
18.5	19 1	19.7	Multiplying Factor	.5 .5	6	10 1	10.8.	11.6	12.4	(Table 20 Continued on Next Page.
30	31	24	Mult	=	21	13	14	15	16	(Tuble
	69.45	1 064				63 40				
	855.56	1.091			×~-	620.64				
	8341.74	1.118		1		1.135				
	263.25	1.064				240.25				
	13½x19½					15½x15½				
	14x20					16x16				

.0.	6 4.23	of J		1		co.	4	70	9	an.	
38 to 7	Deflection equivalent to 1/32	Foot of Span	D	In.	0.531	0.563	0.594	0.625	0,656	0.688	0.719
For full explanation of this table see pages 68 to 70.				2000	47582 0.681 131	44839 0.763 117	42375 0.850 . 105	40112 0.942 94			
le see	flection			1800	42716 0.613 118	40241 0.687 105	38017 0.765 94	35974 0.848 84	34147 0.935 76		
ils tab	num Dei inds per			1600	37850 0.545 104	35643 0.611	33659 0.680 83	31836 0.754 75	30205 0.831 67	28701 0.912 61	27326 0.997 56
on of th	Maxin s in Pou			1500	35417 0.511 98	33344 0.572 87	31480 0.637	29767 0.706 70	28234 0.779 63	26820 0.855 57	25527 0.935 52
lanatic	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated			1400	32984 0.477 91	31045 0.534 81	29301 0.595 72	27698 0.659 65	26263 0.728 59	24939 0.798 53	23728 0.872 48
ull exp	in Pour for Unit quare h			1300	30551 0.443 84	28746 0.496 75	27122 0.552 67	25629 0.612 60	24292 0.676 54	23058 0.741 49	21929 0.810 45
For f	Loads Inches,		_	1200	28118 0.409 78	26447 0.458 69	24943 0.510 62	23560 0.565 55	22321 0.624 50	21177 0.684 45	20130 0.748 41
· 1	al Safe		7	1100	25685 0.375 71	24148 0.420 63	22764 0.468 56	21491 0.518 50	20350 0.572 45	$\frac{19296}{0.627}$	18231 0.686 37
1	Tota		000	1000	23252 0.341 64	21849 0.382 57	20585 0.425 51	19422 0.471 46	18379 0.520 41	17415 0.570 37	16532 0.623 34
	Refer-	_			1260	-000	-000	357	32	~0.00	-0700
	Ratio of Span to Depth	of Surfaced Timber	ч/1		13.2	13.9	14.7	15.5	16.3	17.0	17.8
	Span	4		Ft.	17	18	19	20	21	22	23
	Weight per Lineal Foot (Based on	Green Timber at 38	lbs. per cu. ft.)	Lbs.				63 40			
	Section Modu- lus	S Dh2	9	ln.3				620.64			
nued.	Moment of Inertia	J=-	12	In.4				1 135			
20-Continued	Area Cross Section	A=bh		Sq. 1n.				240.25	*		
11	Size	Surfaced S1S1E	or S4S	In.		,		15½x15½			
TABLE	30	Rough		Ē				16v16 1			

750	781	813	844	875		375	0.406	0.438	0.469
0.	0	0.3	0.8	0.8		0.0	0.	0.	0.
				* * .	1.10 0.97 1.03				
					1.10 0.97 1.03				62232 0.423 173 175
					1.10 0.97 1.03		63981 0.282 205 180	59270 0.327 177	55198 0.376 153
					1.10	65051 0.225 226 182	59924 0.265 192	55503 0.307 165	51681 0.352 144
22614 0.950 44		: : :			1.10 0.97 1.03	60657 0.210 211 170	55867 0.247 179	51736 0.287 154	48164 0.329 134
20890 0.882 41	19930 0.958 37				1.10 0.97 1.03	56263 0.195 195 158	51810 0.229 166	47969 0.266 143	44647 0.305 124
19166 0.814 37	18275 0.884 34	17443 0.956 31			1.10	51869 0.180 180 146	47753 0.212 153	44202 0.246 132	41130 0.282 114
17442 0.746	16620 0.811 31	15852 0.876 29	15152 0.945 26		1.10 0.97 1.03	47475 0.165 165 134	43696 0.194 140	40435 0.225 120	37613 0.258 105
15718 0.679 31	14965 0.737 28	14261 0.796 26	13619 0.859 24	13005 0.923 22	1.10 0.97 1.03	43081 0.150 150	39639 0.176 127	36668 0.205 109	34096 0.235 95
-0100	- 67 65		→ 000		-04	⊣ 0004	-01004	, ⇔ ∞ ⇔	H01004
18.6	19.4	20.1	20.9	21.7	Multiplying Factor	8.3	8.9	9.6	10.3
24	25	26	27	78	Multi Fac	12	13	41	15
		63.40	1.065				71.58	1.061	
		620.64	1.099				791.15	1.091	
		4810.01	1.135				6922.53	1.123	,
		240.25	1.065		7		271.25	1.061	
		15½x15¾					152x174		
		16x16					16x18		

(Table 20 Continued on Next Page.)

-	The second later of the second	and a second							the fall of pages or an area.	-	-
For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent	Inch per Foot of Span	D	ln.	0.500	0.531	0.563	0.594	0.625	0.656	0.688
pages	ns in			2000	64775 0.534 169 182	60803 0.603 149	57311 0.676 133	54160 0.753 119	51309 0.834 107	48717 0.920 97	
ole see	effection			1800	58183 0.481 152	54601 0.543 134	51451 0.609 119	48608 0.678 107	46035 0.751 96	43695 0.828 87	41589 0.909 79
his tal	num D unds be	ą.		1600	51591 0.427 134	, 48399 0, 482 119	45591 0.541 106	43056 0 603 94	40761 0.668 85	38673 0.736 77	36793 0.808 70
on of t	d Maxii	indicate		1500	48295 0.401 126	45238. 0 452 111	42661 0.507 99	40280 0.565 88	38124 0.626 79	36162 0.690 72	34395 0.758 65
planati	nds, and	nch, as		1400	44999 0.374 117	42197 0 422 103	39731 0.473 92	37504 0.527 82	35487 0.584 74	33651 0.644 67	31997 0.708 61
full ex	Total Safe Loads in Pounds, and Maximum Deflections in Inches for Unit Stresses in Pounds per	Square Inch, as indicated		1300	41703 0.347 109	39096 0.392 96	36801 0.440 85	34728 0.490 76	32850 0.543 68	31140 0.598 62	29599 0.657 56
For	Loads Inches,	,2		1200	38407 0 321 100	35995 0.362 88	33871 0.406 78	31952 0 452 70	30213 0.501 63	28629 0.552 57	27201 0.606 52
	tal Safe			0011.	85111 0 294 91	32894 0 332 81	30941 0.372 72	29176 0.414 64	27576 0.459 57	26118 0.506 52	24803 0.556 47
				1000	31815 0.267 83	29793 0.301 73	28011 0.338 65	26400 0 377 58	24939 0.417 52	23607 0.460 47	22405 0 505 42
		Num-			-0.00	H 61 60	~0700	-0100	327	- 22 65	225
	Ratio of Span to	Depth of Surfaced Timber	q/7		11 0	11 7	12.3	13.0	13.7	14 4	15.1
		Span		Ft.	16	17	8	61	Ş	21	25
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	T.h.s.			71 5×		~		
	Section Modu- lus	S	9	In.3			791.15	1 091			
inued.	Moment of Inertia	hdb 1	12	In.1	West Assemble		6922.53	1.123			
-Continued	Area Oross Section A=bh			Sq. In.		Vertican	271.25 6	1.061			
LE 20	Size	Surfaced S1S1E	04 O40	Jn.	· v	Marie - Ton	153x173			-	
TABLE	Size Sugh Sur			In.			16x18 1	~			

0.719	0 750	0.781	0.813	0.844	0.875	906.0	0.938		0.438	
			: : :					1.09		
39610 0 994 72								1.09		
35026 0.884 63	33450 0 961 58	: : :	1 : :					1.09		
32734 0.829 59	31252 0.901 54	29860 0 979 50						1.09	69068 0.276 185 174	
30442 0.773 55	29054 0.841 50	27750 0.914 46	26545 0 987 43	: : :				1.09	64389 0.257 173 163	
28150 0.718 51	26856 0.781 47	25640 0 848 43	24516 0 917 39	23470 0.989 36				1.09	59710 0.239 160 151	
25858 0.663 47	24658 0.721 43	23530 0.783 39	22487 0.846 36	21516 0.913 33	20604 0.982 31			1.09	55031 0.221 148 139	86.)
23566 0.608 43	22460 0 661 39	21420 0.718 36	20458 0.775 33	19562 0.837 30	18720 0.900 28	17934 0.965 26		1.09 0.97 1.03	50352 0.202 135 128	xt Pa
21274 0.552 39	20262 0 601 35	19310 0.652 32	18429 0.705 30	17608 0.761 27	16836 0.818 25	16115 0.877 23	15432 0.939 21	1.09 0.97 1.03	45673 0.184 1122 116	N cro
- 24 55	03 00	-0160	A 01 00		220	- 63 65	-0.00	m 07 4	-0.004	tinned
15.8	16.5	17.1	17.8	18.5	19.2	19.9	20.6	Multiplying Factor	8.6	(Toble 20 Confinned on Next Page.)
23	24	25	26	27	28	29	30	Mult	41	(Toh)
			1	1.061					79.80	
				1.091					982.31	
				1.123					9577.55	
				1.061					302.25	
				15½x17½					15½x19½	
	_			16x18					16x20	

(Table 20 Continued on Next Page.)

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-Continued.	
0-Continued.	
20—Continued.	
20—Continued.	
FABLE 20—Continued.	

						-				
For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Inch per Foot of Span	D	In.	0.469	0.500	0.531	0.563	0.594	0.625
ages 6			0000	2000				71364 0.607 149 181	67464 0.676 133	63904 0.749 120
e see p	flections		000	1800		72397 0.432 170 183	67980 0.487 150	64084 0.547 134	60566 0.609 120	57354 0.674 108
is tabl	um De		000,	1000	68691 0.337 172 173	64211 0.384 151	60276 0.433 133	56804 0.486 118	53668 0.541 106	50804 0.599 95
n of th	Maxim in Pou		90	nnet	64323 0.316 161	60118 0.360 141	56424 0.406 125	53164 0.455 111	50219 0.507	47529 0.562 89
anation	ls, and Stresses		90	1400	59955 0.295 150	56025 0.336 131	52572 0.379 116	49524 0.425 103	46770 0.474 92	44254 0.524 83
ll expl	in Pounds, and Maxim for Unit Stresses in Pou		9001	1900	55587 0.274 139	51932 0.312 122	48720 0.352 108	45884 0.395 96	43321 0.440 85	40979 0.487 77
For fu	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated	Ī	1000	1200	51219 0.253 128	47839 0.288 112	44868 0.324 99	42244 0.364 88	39872 0.406 79	37704 0.449 71
	1 Safe		90	0011	46851 0.232 117	43746 0.264 103	41016 0.298 90	38604 0.334 80	36423 0.372	34429 0.412 65
	Tota	900	1000	42483 0.211 106	39653 0.240 93	37164 0.271 82	34964 0.304 73	32974 0.338 65	31154 0.375 581	
	Refer-	Num- ber			-01004	1004	- 22 60	H01004	-000	-0100
	Ratio of Span to	Of Of Surfaced Timber	1/h		9.2	8.6	10.5	11 1	11.7	12.3
	5	пвфо		Ft.	15	16	17	18	19	20
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			79.80	80.		
	Section Modu- lus	bh²	9	ln.ª	A		982.31	8		
nued.	# #		12	In.4			9577.55			
-Continued	Area Cross Section	A==bh		Sq. In.			302.25	200	-	
LE 20-	Size	rfaced					15\frac{2}{3} x 19\frac{1}{2}			-
TABLE	33	Rough		In.			16x20			

0.656	0.688	0.719	0.750	0.781	0.813	0.844	0.875	906.0	0.938	0.969
60724 0.826 108	57825 0.907 99	55145 0.991 90								
54484 0 743 97	51867 0.816 88	49447 0.892 81	47225 0.971 74							
48244 0.661 86	45909 0.725 78	43749 0.793 71	41765 0.863 65	39925 0.937 60						
45124 0.619 81	42930 0.680 73	40900 0.743 67	39035 0.809 61	37305 0.878 56	35725 0.950 52					
42004 0.578 75	39951 0.635 68	38051 0.694 62	36305 0.755 57	34685 0.820 52	33205 0.887 48	31824 0.956 44				
38884 0.537 69	36972 0.589 63	35202 0.644 57	33575 0.701 52	32065 0.761 48	30685 0.824 44	29397 0.888 41	28186 0.955 38			
35764 0.496 64	33973 0.544 58	32353 0.595 53	30845 0.647 48	29445 0.703 44	28165 0.760 41	26970 0.820 37	25846 0.882 35	24794 0.946 32		
32644 0.454 58	31014 0.499 53	29504 0.545 48	28115 0.593 44	26825 0.644 40	25645 0.696 37	24543 0.752 34	23506 0.808 31	22535 0.867 29	21620 0.928 27	20759 0.991 25
29524 0.413 53	28035 0.454 48	26655 0.496 43	25385 0.539 40	24205 0.586 36	23125 0.633 33	22116 0.683 31	21166 0.735 28	20276 0.788 26	19437 0.843 24	18647 0.901 23
-000	-0.00	~ 01 co	-0300	-0100	-0100	-0100	-000	- 62.60		
12.9	13.5	14 2	14.8	15.4	16.0	16.6	17.2	17.8	18.5	19.1
21	22	23	24	25	26	27	28	29	30	31
				79.80	1.058					
				982.31	1.086					
		-		9577.55	1.114					
				302.25	1.058					
				15½x19¾						
-				16x20						

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equivalent to 1/32 Inch per	Foot of Span	Q	ln.	1.000		0.469	0.500	0.531	0.563
ages 6	ai s		9006	7000		1 09 0 97 1 03				
e see r	flections		1000	noer		1.09 0.97 1.03	: -			77995 0 496 148 179
is tabl	um De nds per		1600	1000		1.09 0.97 1.03		78146 0.348 167 179	73386 0.393 147	69153 0,441 131
n of th	Maxim in Pou		1200	nner		1.09 0.97 1.03	78256 0.287 178 179	73174 0.326 156	68706 0 368 138	64732 0.413 123
anatio	ls, and Stressee ch, as in		400	0.04.1		1 09 0 97 1 03	72951 0.268 166 167	68202 0 304 145	64026 0 344 128	60311 0.386 114
ill expl	Total Safe I		0001	Over	. :	1 09 C.97 1 03	67646 0.248 154 155	63230 0 283 135	59346 0 319 119	55890 0 358 106
For fu			0001	1200		1 09 0 97 1 03	62341 0 229 142 143	58258 0 261 124	54666 0 295 110	51469 0 330 98
			0011	1100		1 09 0 97 1 03	57036 0 210 130 132	53286 0 239 114	49986 0 270 100	47048 0 303 89
			1000	1000	17927 0 959 21	1 09 0 97 1 03	51731 0 191 118 120	48314 0.217 103	45306 0 245 91	42627 0 275 81
	Refer-	Num- ber			- 24 55	- 24	-2024	-01004	- 25	
	Ratio of Span to Denth	of Surfaced Timber	1/h		19.7	Multiplying Factor	∞ 4.	6: ×	9.5	10 0
	S. Carlo			Ft.	32	Mult	i re	9	17	<u>~</u>
	Weight per Lineal Foot (Based	Green Timber	lbs. per cu. ft.)	Lbs.	79.80	1 058	(87.90	1 056	
	Section Modu- lus	bh2	9	Jn.3	982 31	1 086		1194.15	1 081	
nued.	Moment of Inertia	bb3	12	In.4	9577.55	1.114	1	12837.07 1194.15	1.106	
20-Continued	Area Cross Section	Hph		Sq. In.	302.25	1 058	1	60	1 056	
	Size	Surfaced	or S4S	ln.	153x193			153x213		
TABLE	75	Rengh		In.	16x20			16x22		

								-	
0.594	0.625	0.656	0.688	0.719	0.750	0 781	0.813	0.844	0.875
	77822 0.680 133 179	73954 0.749 120	70426 0 823 109	67179 0 900 100	64230 0.978 91				
73732 0.552 132	69864 0.612 119	66374 0.674 108	63190 0.740 98	60259 0.809 89	57596 0.880 82	55079 0.956 75			
65354 0.491 117	61906 0.544 105	58794 0.599 95	55954 0.658 87	53339 0.720 79	50962 0.783 72	48715 0.850 66	46691 0.918 61	44796 0.991 57	
61165 0.460 110	57927 0.510 99	55004 0.562 89	52336 0.617 81	49879 0.674 74	47645 0.734 68	45533 0.796 62	43630 0.862 57	41848 0.930 53	40154 1.000 49
56976 0.429 102	53948 0.476 92	51214 0.525 83	48718 0.576 76	46419 0.630 69.	44328 0.685 63	42351 0.744 58	40569 0.804 53	38900 0.867 49	37313 6.933 45
52787 0.399 95	49969 0.442 85	47424 0.487 77	45100 0.535 70	42959 0.584 64	41011 0.636 58	39169 0 690 53	37508 0.747 49	35952 0.805 45	34472 0.866 42
48598 0.368 87	45990 0.408 78	43634 0 449 71	41482 0.493 64	39499 0.539 59	37694 0.587 54	35987 0.637 49	34447 0.689 45	33004 0.743 42	31631 0.800 39
44409 0.337 80	42011 0.374 72	39844 0.412 65	37864 0.453 59	36039 0.495 53	34377 0.538 49	32805 0.584 45	31386 0.632 41	30056 0.681 38	28790 0.733 35
40220 0.307	38032 0.340 65	36054 0.375 59	34246 0.411 53	32579 0.450 48	31060 0.489 44	29623 0.531	28325 0.574 37	27108 0.619 34	25949 0.666 32
3 2 1	-0254	-2150	- 21 00	327	01 00	- 27 25		-200	
10.6	11.2	11.7	12 3	12.8	13.4	14.0	14.5	15.1	15.6
19	96	12	55	23	24	25	26	27	58
				87 90					
				194.15	9				
				12837.07 1194.15	8				
				25	960			_	
					-				
				15½x21⅓					
				16x22					

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Defiection equivalent to 1/32 Inch per Foot of Span			In.	906.0	0.938	0.969	1.000	1.031		0.500
ages (s in			2000						1.08	
e see I	flection		000	1800						1.08 0.98 1.02	
is tabl	um De		000	1600						1.08	
n of th	Maxim in Pou		1	0001						1.08	87653 0.299 171 184
anatio	in Pounds, and Maxim for Unit Stresses in Pour Square Inch, as indicated			1400	35853 1.000 42					1.08	81707 0.279 160 171
ll expl	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Incb, as indicated		1000	1300	33110 0.928 39	31838 0.994 36				1.08	75761 0.259 148 159
For fu			0001	1200	30367 0.857 36	29186 0.917 33	28091 0.981 31			1.08	69815 0.239 136 147
			100	0071	27624 0.786 32	26534 0.841 30	25523 0 898 28	24545 0.957 26		1.08	63869 0.219 125 135
			1000	7007	24881 0.714 29	23882 0.764 27	22955 0.817 25	22058 0.870 23	21209 0.925 22	1.08	57923 0.199 113 122
	Refer-	Num- per			-0100	7200	- 22 60	-0100	-0100	-04	-00m4
	Ratio of Span to	of of Surfaced Timber	q/2		16.2	16.7	17 3	17.9	18.4	Multiplying Factor	8.2
	S. S.	оран		Ft.	29	30	31	32	33	Multi	16
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			87.90	3		!	
	Section Modu- lus	bh²	9	In.3			1194.15	9		-	
nued.	Moment of Inertia	Jehs I	12	In.4			12837.07 1194.15	3		a. a.	
-Continued	Area Cross Section	A=bh		Sq. In.			333 25	23		1	
20	Size	Surfaced	or S4S	In.			16x22 15½x21½				
TABLE	20	Rough		In.			16x22				

0.531	0.563	0.594	0.625	0.656	0.688	0.719	0.750	0.781
			: : : :		84407 0.753 120 178	80570 0.823 109	76994 0.895 100	73739 0.971 92
			83741 0.560 131 176	79539 0.617 118	75755 0.677 108	72292 0.740 98	69064 0.806 90	66125 0.874 83
87951 0.359 162 185	82830 0.403 144	78287 0.449 129	74223 0.498 116	70477 0.549 105	67103 0.602 95	64014 0.658 87	61134 0 716 80	58511 0.777 73
82352 0.337 151	77545 0.378 135	73280 0.421 121	69464 0.467 109	65946 0.514 98	62777 0.564 89	59875 0.617 81	57169 0.672 74	54704 0.729 68
76753 0.316 141	72260 0.353 125	68273 0.393 112	64705 0.435 101	61415 0.480 91	58451 0.527 83	55736 0.576 76	53204 0.627 69	50897 0.680 64
71154 0.292 131	66975 0.327 116	63266 0.365 104	59946 0.404 94	56884 0.446 85	54125 0.489 77	51597 0.535 70	49239 0.582 64	47090 0.632 59
65555 0.270 121	61690 0.302 107	58259 0.337 96	55187 0.373 87	52353 0.411 78	49799 0.452 71	47458 0.494 64.	45274 0.537 59	43283 0.583 54
59956 0.247 110	56405 0.277 98	53252 0.309 88	50428 0.342 79	47822 0.377 71	45473 0.414 65	43319 0.453 59	41309 0.493 54	39476 0.534 49
54357 0.225 100	51120 0.252 89	48245 0.281 79	45669 0.311 71	43291 0.343 64	41147	39180 0.411 53	37344 0.448 49	35669 0.486 45
L 03 02 4	63 65	-000	H 63 63 44	67 co	⊣ ⊠∞4	200	₩07.65	63 65
8.7	9.2	9.7	10.2	10.7	11.2	11.7	12.3	12.8
17	18	19	20	21	22	23	24	25
				96.10				
				1.076				
				16763.10 1426.65 1.100 1.076				
				364.25 1				
				154x234				
				16x24				

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Defice- tion equivalent to 1/32	Foot of Span	D	In.	0.813	0.844	0.875	906.0	0 938	0.969	1.000			
веев в			0006	0007					::::					
e see I	flection		1000	1900	63382 0.946 76									
is tabl	num De unds per		1600	7000	56062 0.840 67	53792 0.907 62	51694 0 974 58							
n of th	Maxin s in Pou ndicate		0041	0001	52402 0.788 63	50268 0.850 58	48295 0 913 54	46429 0 980 50						
lanatio	ds, and Stresse		1400	1400	48742 0.735 59	46744 0.793 54	44896 0.852 50	43148 0 915 47	41513 0 980 43					
ıll expl	in Pounds, and Maxim for Unit Stresses in Pou Square Inch, as indicated		1900	oner	45082 0 683 54	43220 0.737 50	41497 0 792 46	39867 0.850 43	38342 0 910 40	36931 0 971 37				
For fu	Loads i nches, f	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated			900		1500	41422 0.630 50	39696 0.680 46	38098 0.730 43	36586 0.784 39	35171 0 840 37	33861 0.896 34	32603 0.956 32
	d Safe		1180	2011	37762 0.578 45	36172 0.623 42	34699 0.670 39	33305 0.719 36	32000 0.770 33	30791 0.822 31	29630 0 876 29			
	Tota				34102 0.525 41	32648 0.567 38	31300 0.609 35	30024 0.653 32	28829 0.700 30	27721 0.747 28	26657 0.796 26			
	Refer-					350 ↔	07 00	- 67 65	357	-0.6	-0100			
	Ratio of Span to	7.2			13.3	13.8	14 3	14 8	15 3	15 8	16.3			
	S. S. S. S. S. S. S. S. S. S. S. S. S. S	100		Ft.	26	27	28	29	30	25	32			
	Weight per Lineal Foot (Based	Green Timber	lbs. per cu. ft.)	Lbs.			96 10	1.054						
	Section Modu- lus	S. S.	9	In.3			1426 65	9/0						
nued.	Moment of Inertia	bh³	12	In.4			16763 10 1426 65							
-Conti	Area Cross Section	A==bh		Sq. In.				1034						
FABLE 20—Continued	Size	Surfaced	or S4S	In.	1		16x24 15½x23½							
TAB	₹.	Rough	0	In.			16x24			V				

1.031	1.063	1 094		0.375	0.406	0.438	0.469	0.500	0.531	
			1 08 1 02 1 02					73127 0.534 169 182	68666 0.603 150	
	: : .		1 08 0.98 1 02				70229 0.423 173 175	65685 0.481 152	61662 0.543 134	
			1 08 0.98 1.02		72229 0.282 206 180	66917 0.327 177	62291 0.376 154	58243 0.427 135	54658 0.482 119	
			1.08	73445 0.225 227 182	67649 0.265 193	62664 0.307 166	58322 0.352 144	54522 0.401 126	51156 0.452 111	
• • • • • • • • • • • • • • • • • • • •			1.08 0.98 1.02	68484 0.210 211 170	63069 0.247 180	58411 0.287 155	54353 0.329 134	50801 0.374 118	47654 0.422 104	
			1.08 0.98 1.02	63523 0.195 196 158	58489 0.229 167	54158 0.266 143	50384 0.305 124	47080 0.347 109	44152 0.392 96	
			1.08 0.98 1.02	58562 0.180 181 146	53909 0.212 154	49905 0.246 132	46415 0.282 115	43359 0.321 100	40650 0.362 89	ge.)
28543 0.931	27533 0.988 25		1.08 0.98 1.02	53601 0.165 165 134	49329 0.194 141	45652 0.225 121	42446 0.258 105	39638 0.294 92	37148 0.332 81	ext Pa
25660 0.846 24	24733 0.899 23	23837 0.952 21	1.08 0.98 1.02	48640 0.150 150 122	44749 0.176 128	41399 0.205 110	38477 0.235 95	35917 0.267 83	33646 0.301 73	on Ne
-0100	61 00	-0100	-04	-0004	− €300 4		-01004	- 01 00 4		tinued
16.9	17.4	17.9	Multiplying Factor	80	8.8	9.6	10.3	11.0	11 7	Table 20 Continued on Next Page.
33	34	35	Multi	12	13	14	15	16	17	(Table
	96.10	1.054				80.80	1 058			
	1426.65	1.076				893.23	1.088			
	16763.10 1426.65	1.100	-			7815.76	1.120			
	364.25	1.054		1		306.25	1.058			
-	15½x23½			1		$17\frac{1}{2}x17\frac{1}{2}$				
	16x24			1		18x18				

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32	Inch per Foot of Span	Q	In.	0.563	0.594	0.625	0.656	0.688	0.719	0.750
ages 6			9000	2000	64705 0.676 133	61125 0.753 119	57924 0.834 107	55023 0.920 97			: : :
le see I	flections		0001	1800	58089 0.609 120	54859 0.678 107	51970 0.751 96	49351 0.828 87	46948 0 909 79	44743 0.994 72	
ils tab	num De	4	000	0001	51473 0.541 106	48593 0.603 95	46016 0.668 85	43679 0.736 77	41534 0.808 70	39565 0.884 64	37756 0.961 58
n of th	Maxin s in Pou		1800	0061	48165 0.507 99	45460 0.565 89	43039 0.626 80	40843 0.690 72	38827 0.758 65	36976 0.829 60	35275 0.901 54
lanatio	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Sonare Treh, as indicated		1400	1400	44857 0.473 92	42327 0.527 83	40062 0.584 74	38007 0.644 67	36120 0.708 61	34387 0.773 55	32794 0.841 51
ıll exp	n Poun for Unit		1900	1900	41549 0.440 86	39194 0.490 76	37085 0.543 69	35171 0.598 62	33413 0.657 56	31798 0.718 51	30313 0.781 47
For fi	Loads i	5	1900	1200	38241 0.406 79	36061 0.452 70	34108 0.501 63	32335 0.552 57	30706 0.606 52	29209 0.663 47	27832 0.721 43
	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		2	1100	34933 0.372 72	32928 0.414 64	31131 0.459 58	29499 0.506 52	27999 0.556 47	26620 0.608 43	25351 0.661 39
	Tota		1000	0001	31625 0.338 65	29795 0.377 58	28154 0.417 52	26663 0.460 47	25292 0.505 43	24031 0.552 39	22870 0.601 35
	Refer-	Num- ber			02 00	₩ C7 C9	-0100	-878	-0769	222	-0.00
	Ratio of Span to	of of Surfaced Timber	¶/2		12.3	13.0	13.7	14.4	15.1	15.8	16.5
	200	ngdo		Ft.	18	19	20	21	22	23	24
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				1.058			
	Section Modu- lus	S S	9	In.3				893.23			
inued.	Moment of Inertia		12	1n.4				7815.76			
-Continued	Area Cross Section			Sq. In.				306 25			
LE 20-	Size Size Surfaced Rough SiSiE A		or S4S	In.				173×173			
TABLE				In.				18x18			

0.781	0.813	0.844	0.875	906.0	0.938		0.438	0.469	0.500	
: : :	: : :					1.09 0.97 1.03				
		* * * * * * * * * * * * * * * * * * * *				1.09 0.97 1.03			81719. 0.432 170 183	
						1.09 0.97 1.03		77497 0.337 172 173	72479 0.384 151	
33695 0.979 50			: : :		: : :	1.09	77939 0.276 186 174	72569 0.316 161	67859 0.360 141	
31314 0.914 46	29959 0.987 43	: : :	: : :	: : :		1.09 0.97 1.03	72659 0.257 173 163	67641 0.295 150	63239 0.336 132	
28933 0.848 43	27669 0.917 39	26471 0.989 36				1.09 0.97 1.03	67379 0.239 160 161	62713 0.274 139	58619 0.312 122	
26552 0.783 39	25379 0.846 36	24267 0.913 33	23262 0.982 31			1.09 0.97 1.03	62099 0.221 148 139	57785 0.253 128	53999 0.288 113	ze.)
24171 0.718 36	23089 0.775	22063 0.837 30	21135 0.900 28	20229 0.965		1.09	56819 0.202 135 128	52857 0.232 118	49379 0.264 103	xt Pag
21790 0.652 32	20799 0.705	19859 0.761 27	19008 0.818 25	18177 0.877 23	17426 0.939 22	1.09 0.97 1.03	51539 0.184 123 116	47929 0.211 107	44759 0.240 93	on Ne
- c1 co	63 69		0.00	-0700	-0100	-1034	1102004	H61004	-0.024	tinued
17.1	17.8	18.5	19.2	19.9	20.6	Multiplying Factor	8.6	9.3	9.8	Table 20 Continued on Next Page.
25	26	22	28	29	30	Mult	14	15	16	(Table
			80.80 1.058					90.05		
			893.23 1.088					1109.06		
			7815.76					10813.37 1109.06 1.110 1.082		
			306.25					341.25		
			17½x17½					17\frac{1}{2}x19\frac{4}{2}		
			18x18					18x20		

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8 to 70.	Deflection tion equivalent to 1/32 Inch per	Foot of Span	D	ln.	0.531	0.563	0 594	0 625	0 656	0 688
For full explanation of this table see pages 68 to 70			0006			80499 0.607 149 181	76109 0.676 134	72119 0.749 120	68509 0.826 109	65219 0 907 99
e see p	flections		1800		76715 0.487 150	72287 0.547 134	68327 0 609 120	64727 0.674 108	61469 0.743	58499 0.816 89
is tabl	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1600		68021 0.433 133	64075 0.486 119	60545 0.541 106	57335 0.599 96	54429 0.661 86	51779 0.725 .78
n of th	Maxim s in Pou ndicated		1500		63674 0.406 125	59969 0.455 111	56654 0.507 99	53639 0 562 89	50909 0.619 81	48419 0.680 73
anatio	ds, and Stresses		1400		59327 0.379 116	55863 0.425 104	52763 0.474 93	49943 0 524 83	47389 0.578 75	45059 0.635 68
ıll expl	in Pounds, and Maxim for Unit Stresses in Pou Square Inch, as indicated		1300		54980 0.352 108	51757 0.395 96	48872 0.440 86	46247 0 487 77	43869 0.537 70	38339 41699 0 544 0.589 58 63
For fu	Loads i nches, f		1900		50633 0.324 99	47651 0.364 88	44981 0 406 79	42551 0 449 71	40349 0.496 64	38339 0 544 58
	ll Safe		1100		46286 0.298 91	43545 0.334 81	41090 0.372 72	38855 0.412 65	36829 0.454 59	34979 0.499 531
	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1000		41939 0.271 82	39439 0.304 73	37199 0.338 65	35159 0.375 59	33309 0.413 53	31619 0.454 48
	Refer-	Num- ber			- 27 55	-21254	5/4 5/5	- 24 23	-2122	-21 65
	Ratio of Span to Depth	Surfaced Timber	1/h		10.5	=	11 7	12 3	12 9	13.5
	Span			Ft.	17	<u>×</u>	19	50	21	- 25
	Weight per Lineal Foot (Based on	Green Timber at 38	lbs. per	Lbs.			90.95			
	Section Modu- lus	bh2	9	In.3			1109 06			
nued.	Moment of Inertia	bh ³	12	In 1			10813.37 1109.06 1 110 1 082			
20-Continued	Area Cross Section			Sq. In.	t		341 25			
	Size		or S4S	In.			18x20 172x192			
TABLE	7.	Bough	0	11.			18v20			

								_	-	
0.719	0 750	0 781	0 813	0 844	9 875	906 0	0 938	696 0	1.000	
62189 0 991 90		: . !				: : :				1.08
55763 0 892 81	53279 0.971 74	::::	:		::	: : :	: : :			1.08 0.97 1.03
49337 0.793 72	47119 0.863 65	45061 0 937 60	:		,	: :	:::			1 08 0 97 1 03
46124 0.743 67	44039 0 809 61	42104 0 878 56	40289 0 950 52							1 08 0 97 1.03
42911 0.694 62	40959 0.755 57	39147 0.820 52	37447 0 887 48	35915 0 956 44					: : :	1 08 0 97 1 03
39698 0.644 58	37879 0.701 53	36190 0.761 48	34605 0.824 44	33176 0.888 41	31799 0 955 38					1.08
36485 0.595 53	34799 0.647 48	33233 0.703 44	31763 0.760 41	30437 0.820 38	29159 0.882 35	27977 0.946 32				1.08
33272 0 545 48	31719 0 593 44	30276 0.644 40	28921 0.696 37	27698 0.752 34	26519 0.808 32	25428 0.867 29	24392 0.928 27	23422 0.991 25		1.08
30059 0 496 44	28639 0.539 40	27319 0.586 36	26079 0.633 33	24959 0 583 31	23879 0.735 28	22879 0.788 26	21929 0.843 24	21039 0.901 23	20219 0.959 21	1.08 0.97 1.03
-2120	22.5	321	-200	~ 01 co	-0100	-26	-00	-0100	-0100	-24
14 2	25 %	15 4	16 0	16 6	51 [-	17 8	18.5	19 1	19.7	lying
661	74	255	36	27	28	53	30	31	32	Multiplying 2 0 97 0 97 0 1. Factor 4 1 03 1 03 1 1.0
				à	1.055					
··							***			
				0011	1.110 1.082					
			-		1.110					
				0 170	1.055					e w-
				5	1/2×192					
					18X20					

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Deffec- tion equiva- alent to 1/32	Foot of Span	Q	In.	0.469	0.500	0.531	0.563	0.594	0.625
		2000							87875 0.680 133 179
flections		1800					88051 0.496 148 179	83254 0.552 133	78889 0.612 120
num De inds per		1600			88316 0.348 167 179	82905 0.393 148	78069 0.441 132	73794 0.491 118	69903 0.544 106
Maxim s in Pou	1500			88376 0.287 179 179	82697 0.326 157	77618 0.368 138	73078 0.413 123	69064 0.460 110	65410 0.510 99
Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1400		82385 0.268 166 166	77078 0.304 146	72331 0.344 129	68087 0.386 115	64334 0.429 103	60917 0.476 92
n Poun for Unit		1300		76394 0.248 154 155	71459 0.283 135	67044 0.319 120	63096 0.358 106	59604 0.399 95	56424 0.442 86
Loads inches, f		1900		70403 0.229 142 143	65840 0.261 125	61757 0.295 110	58105 0.330 98	54874 0.368 88	51931 0.408 79
l Safe]		1100		64412 0.210 130 132	60221 0.239 114	56470 0.270 101	53114 0.303 89	50144 0.337 80	47438 0.374 72
Tota		1000		58421 0.191 118 120	54602 0.217 103	51183 0.245, 91	48123 0.275 81	45414 0.307 72	42945 0.340 65
Refer-	Num-			-004	H 63 50 4	35.		~020	-0004
Ratio of Span to	Surfaced Timber	q/2		4.8	8.8	9.5	10.0	10.6	11.2
200	nedo		F.t.	15	16	17	18	19	50
Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.			99.26	1 052		•
Section Modu- lus	ph2	9	In.3			1348.23	1.077		
Moment of Inertia	pp ²	12	In.4			14493.47 1348.23	1.102		
Area Cross Section	A==bh		Sq. In.			376.25	1 052		
Size	Surfaced		In.			174x214			
Wi Wi	Rough		In.			18x22			

656	889	719	750	81	813	844	875	906	938	696	
9.0	9 0	0.7	0.7	0.781	0.8	0.8	8.0	6.0	0.9	0.0	
83515 0.749 121	79536 0.823 110	75897 0.900 100	72518 0.978 92		. : .						
74955 0.674 108	71364 0.740 98	68079 0 809 90	65028 0.880 82	62229 0 956 75		::					
66395 0.599 96	63192 0.658 87	60261 0.720 79	57538 0.783 73	55039 0.850 67	52747 0.918 61	50584 0.991 57					
62115 0 562 90	59106 0.617 81	56352 0.674 74	53793 0.734 68	51444 0.796 62	49289 0.862 57	47255 0.930 53	45370 1.000 49				
57835 0.525 84	55020 0.576 76	52443 0.630 69	50048 0.685 63	47.849 0.744 58	45831 0.804 53	43926 0.867 49	42160 0.933 46	40521 1.000 42			
53555 0.487 77	50934 0.535 70	48534 0.584 64	46303 0.636 58	44254 0.690 54	42373 0.747 49	40597 0.805 46	38950 0.866 42	37421 0.928 39	35969 0.994 36		
49275 0.449 71	46848 0.493 65	44625 0.539 59	42558 0.587 54	40659 0.637 49	38915 0.689 45	37268 0.743 42	35740 0.800 39	34321 0.857 36	32973 0.917 33	31722 0.981 31	ge.)
44995 0.412 65	42762 0.453 59	40716 0.495 54	38813 0.538 49	37064 0.584 45	35457 0 632 41	33939 0.681 38	32530 0.733 35	31221 0.786 32	29977 0.841 30	28822 0.898 28	xt Pa
40715 0.375 59	38676 0.411 53	36807 0.450 49	35068 0.489 44	33469 0.531 41	31999 0.574 37	30610 0.619 34	29320 0.666 32	28121 0.714 29	26981 0.764 27	25922 0.817 25	on Ne
-0100	₩ C1 C2	-00	₩ 61 66	-000	-000	- 20				-00	Continued on Next Page.
11.7	12.3	12 8	13.4	14.0	14.5	15.1	15.6	16.2	16.7	17.3	8
21	22	23	24	52	26	27	28	56	30	31	(Table
					99.26				-		
manus Parlament Parlament					1348 23	-		•	n		
					93.47	-		-			
		_								-	
					376.25						
					17 <u>1</u> x21 <u>3</u>						
					18x22 1						
					18x					,	

193

8 to 70.	Deflec- tion equiv- alent to 1/32 Inch per	Span	Ω	ln.	1.000	1.031			0.500	0.531	0.563
ages 6			2000				1.08 0.98 1.02	I			: . : !
see b	lections		1800				1.08 0.98 1.02				
s table	im Def		1800			; ;	1.08 0.98 1.02	1		99275 0.359 162 185	93518 0.403 144
of thi	Maximu in Pour		1500				1.08 0.98 1.02	1	98973 0.299 172 184	92955 0 337 152	87551 0.378 135
nation	in Pounds, and Maxim, for Unit Stresses in Pou Square Inch, as indicated		1400	-			1.08 0.98 1.02	11	92259 0.279 160 171	86635 0 315 142	81584 0 353 126
For full explanation of this table see pages 68 to	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1300				1.08		85545 0.259 149 159	80315 0 292 131	75617 0 327 117
or ful	l Safe Loads in Pound Inches, for Unit: Square In		1200				1.08		78831 0.239 137 147	73995 0 270 121	69650 0.302 108
	al Safe Loads i Inches, f So		1100		27722 0.957 26		1.08	1	72117 0.219 125 135	67675 0 247 111	63683 0.277 99
	Total Safe		0001		24913 0.870 24	23953 0.925	1.08		65403 0.199 114	61355 0.225 100	57716 0.252 89
	Refer- ence	Num- ber			-28	-000	- 23 24	4 1	H0/254	₩ 51 to 4	₩0100
	Ratio of Span to Deeth	Surfaced	l'h		17.9	10.4	Multiplying	1000	. 73	r- .c.	23
	Span			Ft.	32	60	Mult	2	16	<u></u>	
	Weight per Lineal Foot Based	Green	at 38 lbs. per cu. ft.	Lbs.		99 26				105.55	
	Section Modu-	2 pps	= 2	ln.3		1348 23				1 072	
nued.	Moment of Ibertia	bh³	12	In.4		14493.47 1348 23 1.102 1 077				411.25 15926.05 1610.73 1 050 1 095 1 072	
20—Continued	Area Cross Section		A=bb	Sq. In.		376 25				1 050	
			SISIE or 242	=		173/212				15524 1743234	
TABLE	Ī.		Rough	In.	1	18x22				15x24	

			,					
0.594	0.625	0.656	0.688	0.719	0.750	0.781	0.813	0 844
		: : :	95271 0.753 120 178	90922 0.823 110	86954 0.895 101	83266 0.971 93	: : :	
	94507 0.560 131 176	89844 0.617 119	85505 0.677 108	81580 0.740 99	77998 0.806 90	74668 0.874 83	71554 0.946 76	
88402 0.449 129	83765 0.498 116	79608 0.549 105	75739 0.602 96	72238 0.658 87	69042 0.716 80	66070 0.777 73	63290 0.840 68	60749 0.907 63
82748 0.421 121	78394 0.467 109	74490 0.514 99	70856 0.564 90	67567 0.617 82	64564 0.672 75	61771 0.729 69	59158 0.788 63	56769 0.850 58
77094 0 393 113	73023 0.435 101	69372 0.480 92	65973 0.527 83	62896 0.576 76	60086 0.627 70	57472 0.680 64	55026 0.735 59	52789 0.793 54
71440 0.365 105	67652 0.404 94	64254 0.446 85	61090 0.489 77	58225 0.535 70	55608 0.582 64	53173 0.632 59	50894 0.683 54	48809 0.737 50
65786 0.337 96	62281 0.373 87	59136 0.411 78	56207 0.452 71	53554 0.494 65	51130 0.537 59	48874 0.583 54	46762 0.630 50	44829 0.680 46
60132 0.309 88	56910 0.342 79	54018 0.377 72	51324 0.414 65	48883 0.453 59	46652 0.493 54	44575 0.534	42630 0.578 46	40849 0.623 42
54478 0.281 80	51539 0.311 72	48900 0.343 65	46441 0.376 59	44212 0.411 53	42174 0.448 49	40276 0.485 45	38498 0.525 41	36869 0.567 38
	-0100+		च्च टा टा य	₩ C1 C2	∺0 00	2 5 7	225	- 63 65
9.7	10.2	10.7	11.3	11.7	12.3	12.8	13.3	13.8
19	50	21	61	23	24	25	26	27
				1.050				
				1.072				-
				1.095				
				1.050				-
-				1, 3x232				
			â	toxet				

(Table 20 Continued on Next Page.)

For full explanation of this table see pages of the	Deflection tion equivalent to 1/32 Inch per	Span	Q	In.	0.875	0.906	0.938	0.969	1.000	1.031	1.063
a gas	.g		2000					· : ·			
d see b	ections		1800			: :					:
Stant	ım Defi ıds per		1600		58352 0.974 58			: . :			
10 10	Maximu in Pour dicated		1500		54515 0.913 54	52456 0.980 50					
nation	in Pounds, and Maxim, , for Unit Stresses in Pour Square Inch, as indicated		1400		50678 0.852 50	48749 0.915 47	46876 0.980 43		: :		
l expia	Pounds r Unit S sare Inc		1300		46841 0.792 46	45042 0.850 43	43295 0.910 40	41705	: :		:
or ful	Loads in Pounds, and Maximum Del Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1300		43004	41335 0.784 40	39714 0.840 37	38238 0.896 34	36835 0 956 32		::
	Total Safe Loads in Pounds, and Maximum Deflections Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1100		39167 0.670 39	37628 0.719 36	36133 0.770 33	34771 0.822 31	33476 0.876 29	32244 0.931 27	31080 0 988 25
	Total Sa				35330 0.609 35	33921 0.653 33	32552 0 700 30	31304 0.747 28	30117 0.796 26	28987 0.846 24	27919 0.899 23
	Refer-	Num- ber			-0100	₩ 63 63 H	-0.00	3 5 1	35	-000	-06
	Ratio of Span to to Deeth	ъ.				14.8	15 3	15.8	16.3	16.9	17.4
	Span			正.	8:	66	30	8	21	33	34
	Weight per Lineal Foot (Based	Green	at 38 lbs. per cu. ft.)	Lbs.				1 050			
	Section Modu- lus			In.8				1 072			
nued.	A=bh		12	In.4				1 095 1 072			
20—Continued			A=bh	Sq. In.				411.25			
	Size		SISIE or S4S	In.				18x24 17½x23½			
ABLE	523		Rough	In.				8x24			

1.094		0 563	0.594	0.625	0.656	0.688	0.719	0.750
	1.07 0.98 1.02			: : :			107291 0.758 120 185	102573 0.824 110
• :	1 07 0 98 1 02				93864 105906 0.505 0.568 115 129	89377 100873 0.554 0.624 104 118	96291 0.682 107	92033 0.742 98
· 	1 07 0 98 1.02		104290 0.414 141 179	98797 0.458 127	93864 0.505 115	89377 0.554 104	85291 0.607 95	81493 0.660 87
	1 07 0 98 1 02	103255 0.348 147	97632 0.388 132	92475 0.430 119	87843 0.474 107	83629 0.520 98	79791 0.569 89	76223 0.618 81
	1.07 0.98 1.02	96230 0.325 137 165	90974 0.362 123	86153 0.401 110	81822 0.442 100	77881 0.485 91	74291 0.531 83	70953 0.577 76
	1 07 0 98 1 02	89205 0.302 127 154	84316 0.336 114	79831 0.374 102	75801 0.411 93	72133 0.451 84	68791 0.493 77	65683 0.536 70
	1.07 0.98 1.02	82180 0.278 117 142	77658 0.310 105	73509 0.344 94	69780 0.379 85	66385 0.415 77	63291 0.455 71	60413 0.495 65
	1.07	75155 0.255 107 130	71000 0.284 96	67187 0.315 86	63759 0.348 78	60637 0.381 71	57791 0.417 64	55143 0.454 59
26900 0.952 21	1.07	68130 0.232 97 118	64342 0.258 87	60865 0.286 78	57738 0.316 71	54889 0.347 64	52291 0.379 58	49873 0.412 53
357	-04	-01004	1024	700		- 07 60	₩01004	H0100
17.9	Multiplying Factor	30 rc	6 8	9.4	6.6	10 4	10.8	11.3
35	Multi	8	19	20	21	22	23	24
				117 70	1.048			
				1808 58	1.068			
				24181 18 1806	1.090			
				446 25	1.048			
				174x254				
				18x26				

(Table 20 Continued on Next Page.)

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32 Inch per	Span	q	In.	0.781	0.813	0.844	0.875	0.906	0.938	0.969
ages 68			2000		98237 0 896 101	94239 0 968 93					::
d ees e	lections		1800		88119 0 806 90	84509 0 871 83	81115 0.940 77			::::	:
is table	im Defids per		1600		78001 0 716 80	74779 0 774 74	71749 0 835 68	68991 0 898 63	66361 0.963 59		
of thi	Maximi in Poun dicated		1500		72942 0 672 75	69914 0.726 69	67066 0 783 64	64473 0 842 59	62000 0.903 55	59738 0.967 51	
anation	is, and stresses h, as in		1400		67883 0 627 70	65049 0.678 64	62383 0 731 59	59955 0 786 55	57639 0.843 51	55520 0.902 47	53470 0.964 44
ll expl	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1300		62824 0 582 64	60184 0.629 59	57700 0 679 55	55437 0 730 51	53278 0.783 47	51302 0.838 44	49390 0.895 41
For fu	Loads ir ches, fo		1200		57765 0.537 59	55319 0.581 55	53017 0 626 50	50919 0 674 47	48917 0.722 43	47084 0.773 40	45310 0.826 37
	Safe I	1100		52706 0.493 54	50454 0.532 50	48334 0.574 46	46401 0 618 42	44556 0.662 39	42866 0.709 37	41230 0.757 34	
,	Total 9				47647 0.448 49	45589 0.484 45	43651 0.522 41	41883 0.561 38	40195 0.602 36	38648 0.644 33	37150 0.688
'	Refer- ence	Num- her			-0100	-36	C1 CO	- 21 60	~0 00	₩ 63 E9	-2180
		of Surfaced Timber	1/h		11.8	7 71	15	50	13.6	14.1	14.6
	200			Ft.	25	97	27	R	29	30	c0
	Weight per Lineal Foot (Based	Green Timber	lhs. per cu. ft.)	Lbs.				11.7 70			
	Section Modu- lus	bh2	9	In.3				1,068			
nued.	Moment of Inertia	bh3	15	le :		The second		446 25 24181.1× 1896 56 1.048 1.090 1.068			
-Continued	Area Cross Section	1		Sq. In				1,048			
20	Size	Surfaced	or 24%	In.		_		18426 174x255			
TABLE	77	-	Kough	In.	1			18426			

1.000	1.031	1.063	1.094	1.125		0.438	0.469	0.500	0.531	
			: : :		1.07					
			: :		1.07 0.98 1.02			91112 0.432 171 183	85558 0.487 151	
		: :		* · · · · · · · · · · · · · · · · · · ·	1.07		86399 0.337 173 173	80810 0.384 152	75862 0.433 134	
					1.07 0.98 1.02	86855 0.276 186 174	80905 0.316 162	75659 0.360 142	71014 0.406 125	
					1.07 0.98 1.02	80971 0.257 174 163	75411 0.295 151	70508 0.336 132	66166 0.379 117	
47607 0.954 38					1.07 0.98 1.02	75087 0.239 161 151	69917 0.274 140	65357 0.312 123	61318 0 352 108	
43655 0.882 35	42087 0.935 33	40636 0.993 31			1.07	69203 0.221 148 139	64423 0.253 129	60206 0.288 113	56470 0.324 100	se.)
39703 0.806 32	38256 0.858 30	36916 0.911 28	35622 0.966 26		1.07	63319 0.202 136 128	58929 0.232 118	55055 0.264 103	51622 0.298 91	xt Pag
35751 0.733 29	34425 0.780 27	33196 0.828 25	32009 0.877 23	30881 0.928 22	1.07 0.98 1.02	57435 0.184 123 116	53435 0.211 107	49904 0.240 94	46774 0.271 82	on Ne
	H 61 69	H 67 69	— 63 ₁ 00	~ 60 €	124	-c1004	→ c7 t3 44	-0.004		Continued on Next Page.
15.1	15.5	16.0	16.5	16.9	Multiplying Factor	% 9	9.5	8.8	10.5	20
32	55	34	35	36	Multi	41	15	16	17	(Table
		117 70	1.048				100 37	1.051		
		808	1.068			1	235 81	1 078		
,		94181 18	1.090				12049.15 1235	1 106		
		448 95 9					380.25	1.051		
		172×954					19½x19½			
		18x96			1		20x20			

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For full explanation of this table see pages 68 to 70.	Deflection country along to 1/32 Inch per Foot of Span	Q	ln.	0 563	0.594	0.625	0.656	0.688	0.719	0.750
ages 6		2000		89774 0.607 150 181	84873 0.676 134	80412 0 749 121	76392 0.826 109	72731 0.907 99	69351 0.991 90	
see b	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated	1800		80616 0.547 134	76195 0.609 120	72170 0 674 108	68542 0.743 98	65237 0.816 89	62185 0.892 81	59385 0.971 74
is table	ım Def	1600		71458 0.486 119	67517 0.541 107	63928 0.599	60692 0.661 87	57743 0.725 79	55019 0.793 72	52519 0.863 66
of thi	Maximu in Poun idicated	1500		66879 0.455 112	63178 0.507 100	59807 0.562 90	56767 0.619 81	53996 0.680 74	51436 0.743 67	49086 0.809 61
anation	s, and Stresses	1400		62300 0.425 104	58839 0.474 93	55686 0.524 84	52842 0.578 76	50249 0.635 69	47853 0.694 62	45653 0.755 57
ll expla	Loads in Pounds, and Maximum De Inches, for Unit Stresses in Pounds per Square Inch, as indicated	1300		57721 0.395 96	54500 0.440 86	51565 0.487 77	48917 0.537 70	46502 0.589 63	44270 0.644 58	42220 0.701 53
For fu	oads in ches, fo	1900	2021	53142 0.364 89	50161. 0.406. 79	47444 0.449 71	41992 0.496 64	42755 0.544 58	40687 0.595 53	38787 0.647 48
	Safe I	95	2071	48563 0 334 81	45822 0.372	43323 0 412 65	41067 0.454 59	39008 0.499 53	37104 0.545 48	35354 0.593 44
	Total	1000	307	43984 0.304 73	41483 0 338 66	39202 0.375 59	37142 0.413 53	35261 0.454 48	33521 0 496 44	31921 0.539 40
	Reference Num-			1-01624	- 228	-0.8	-000	-000	H 67 69	222
	Ratio of Span to Depth of Surfaced	Timber 1/h		11.1	11.7	12 3	12.9	13 5	14.3	14.8
	Span		Ft.	18	19	20	21	22	23	24
	Weight per Lineal Foot (Based on Green	at 38 lbs. per cu. ft.)	Lbs.				100 37			
	Section Modu- lus	S e	In.3				1235.81			
nued.	Moment of Inertia	I=12	In.4				12049.18 1235. 1 106 1 0			
-Continued	Area Cross Section	A=bb	Sq. In.				380.25			
20	Size	SISIE or S4S	In.				19½×19¾			
TABLE	另 一	Rough	In.			-	20x20			

_		- 14							11	
0.781	0 813	0.844	0.875	906.0	0 938	0.969	1.000		0.469	
			: : :		:			1.08 0.97 1.03		
	: : :		- : :	: :		: :		1.08 0.97 1.03		
50243 0.937 60	: :							1.08 0.97 1.03		
46946 0.878 56	44926 0.950 52			::::				1.08 0.97 1.03	98525 0.287 179 179	
43649 0.820 52	41757 0.887 48	40004 0.956 44	: :					1.08 0.97 1.03	91846 0.268 167 167	
40352 0.761 48	38588 0.824 45	36953 0.888 41	35449 0.955 38					1.08 0.97 1.03	85167 0.248 155 155	
37055 0.703 44	35419 0.760 41	33902 0.820 38	32506 0.882 35	31194 0.946 32				1.08 0.97 1.03	78488 0.229 143 143	şe.)
33758 0.644 41	32250 0.696 37	30851 0.752 34	29563 0.808 32	28352 0.867 29	27229 0.928 27	26139 0.991 25		1.08 0.97 1.03	71809 0.210 131 132	xt Pag
30461 0.586 37	29081 0.633 34	27800 0.683 31	26620 0.735 29	25510 0.788 26	24480 0.843 24	23480 0.901 23	22549 0.959 21	1.08 0.97 1.03	65130 0.191 118 120	on Ne
-0100			01 fo	-0.00	225	H 01 60	200	104	H01004	thued
15 4	16 0	16 6	17.2	17.8	18.5	19.1	19.7	Multiplying Factor	4.8	(Table 20 Continued on Next Page.
35	36	20	× 51	56	30	31	32	Multi	15	(Table
				1.00.37					110.60	
			•	1235.81					1502.31	
				12049.18 1235.81 1.106 1.078					16149.87 1502.31 1.099 1.074	
				380.25					419.25	
				19½x19½				-	19½x21½	
		-		20x20					20x22	

For full explanation of this table see pages 68 to 70.	Deflec- tion equiv- alent to 1/32 Inch per	Foot of Span	a	In.	0.500	0.531	0 563	0.594	0.625	0.656
ages 6			2000						97968 0.680 134 179	93057 0 749 121
d ees b	lections		1800				98143 0.496 149 179	92776 0.552 133	87950 0.612 120	83519 0 674 108
s table	um Def ads per		1600		98390 0.348 168 179	92375 0.393 148	87017 0.441 132	82234 0.491 118	77932 0.544 106	73981 0.599 96
of thi	Maximi in Pou dicated		1500		92130 0.326 157	\$6484 0 368 139	81454 0.413 123	76963 0.460 110	72923 0 510 99	69212 0.562 90
anation	ls, and Stresses		1400		85870 0.304 146	80593 0.344 129	75891 0 386 115	71692 0.429 103	67914 0.476 93	64143 0 525 84
ll expla	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1300		79610 0.283 136	74702 0 319 120	70328 0.358 107	66421 0.399 95	62905 0.442 86	59674 0 487 781
For fu			1200		73350 0.261 125	68811 0.295 110	64765 0 330 98	61150 0 368 88	57896 0.408 79	54905 0 449 71
			1100		67090 0.239 114	62920 0 270 101	59202 0 303 90	55879 0 337 80	52887 0 374 72	50136 0.412 65
			1000	2	60830 0.217 .104	57029 0.245 92	53639 0 275 81	50608 0.307 73	47878 0.340 65	45367 0.375 59
	Refer- ence	Num- ber	-		-000	- 24 55	-224	- C3 C3		-0100
	Ratio of Span to Depth	of Surfaced Timber	1/h		8.9	6 6	10.0	10.6	21	11.7
	Span	4		Ft.	16	-1	_	2	3	51
	Weight per Lineal Foot Based on	Green	lbs. per cu. ft.)	Lbs.			110 60	1 049		
2	Section Modu-	bh²	g	In.3			1502.31	1 074		
nued.	Moment of Inertia	bhs	21	In.4			419-25 /16149.87/1502.31	1 099		
-Conti	Area Cross Section		A==Da	Sq. ln.			419 25	1 049		
LABLE 20—Continued	d 2°'.	Surfaced	or viv	In.			20x22 [19]x21].			
TABI	ř.		Kough	In.			20x22			

0.688	0.719	0.750	0.781	0.813	0.844	0.875	906.0	0.938	0.969	1.000
88626 0.823 110	84535 0.900 100	80785 0.978 92		: :	:					
79520 0.740 99	75827 0.809 90	72441 0.880 82	69378 0.956 76							: '
70414 0.658 87	67119 0 720 80	64097 0.783 73	61362 0.850 67	58755 0.918 62	56372 0.991 57					
65861 0.617 82	62765. 0.674 74	59925 0.734 68	57354 0.796 63	54903 0.862 58	52662 0 930 53	50571 1.000 49				
61308 0.576 76	58411 0.630 69	55753 0.685 63	53346 0.744 58	51051 0.804 54	48952 0.867 49	46993 0.933 46	45133 1.000 42			
56755 0.535 70	54057 0 584 64	51581 0.636 59	49338 0.690 54	47199 0.747 50	45242 0.805 46	43415 0.866 42	41680 0.928 39	40088 0.994 36		
52202 0.493 65	49703 0.539 59	47409 0.587 54	45330 0.637 49	43347 0.689 45	41532 0.743 42	39837 0.800 39	38227 0.857 36	36749 0.917 33	35342 0.981 31	
47649 0.453 59	45349 0.495 54	43237 0.538 49	41322 0.584 45	39495 0.632 41	37822 0.681 38	36259 0.733 35	34774 0.786 33	33410 0.841 30	32111 0.898 28	30890 0.957 26
43096 0.411 53	40995 0 450 49	39065 0.489 44	37314 0.531 41	35643 0.574 37	34112 0.619 34	32681 0.666 32	31321 0.714 29	30071 0.764 27	28880 0.817 25	27760 0.870 24
	01 00		- cyps	H0100	21 co	-000	C1 CO	-0100	H 07 00	400
12.3	12.8	13.4	14.0	14.5	15.1	15.6	16.2	16.7	17.3	17.9
22	23	24	25	26	27	78	29	30	31	53
					1.049					
				000	1.074					
	_				1.099					
		_	_		1.049					1
		_	-		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2					_
-		-			7077	_				

(Table 20 Continued on Next Page.)

THE WEST COAST LUMBERMEN'S ASSOCIATION

For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32 Inch per	Foot of Span		In.	1.031		0.500	0.531	0.563	0.594
ages 6	.s		2000			1 07 0 98 1 02			: . :	
see p	lections		1800			1 07 0 98 1 02				
s tabl	um Def ads per		1600			1.07 0.98 1.02		96491 103530 110569 0 315 0 337 0.359 142 152 163	97500 104145 0.378 0.403 135 145	98488 0.449 130
of th	Maximu in Pou dicated		1500			1.07 0 98 1.02	110221 0.299 172 184	103530 0 337 152	97500 0.378 135	92189 0.421 121
nation	s, and Stresses		1400			1 07 0 98 1 02	95267 102744 110221 0.259 0.279 0.299 149 161 172 159 171	96491 0 315 142	90855 0.353 126	85890 0.393 113
l expla	in Pounds, and Maximi for Unit Stresses in Pou Square Inch, as indicated		1300			1 07 0 98 1 02		89452 0 292 132	84210 0.327 117	79591 0.365 105
For ful	Loads in Pounds, and Maximum Del Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1200			1 07 0 98 1 02	87790 0.239 137 147	82413 0 270 121	77565 0 302 108	73292 0.337 96
	Safe L		1130			1 07 0 98 1.02	80313 0.219 125 135	0.247	70920 0.277 98	66933 0.309 88
	Total Safe Loads in Pounds, and Maximum Deflections Inches, for Unit Stresses in Pounds per Square Inch, as indicated		9000			1.07 0 98 1.02	72836 0.199 114 122	68335 0.225 101	64275 0.252 89	60694 0.281 80
	Refer- ence				-0189	-04	ous4	-01004	-0100	-0169
	Ratio of Span to Depth		q/2		18.4	Multiplying Factor	x 22	2	9 2	2 6
	Span			F.	33	Multi	10	17	×	19
	Weight Per Lineal Foot (Based	Green Timber	lbs. per cu. ft.)	Lbs.	110.60	1.049		120 92		
	Section Modu- lus	bh²	ω ω	In.a	1502.31	1.074	,'	1794 81		
nued.	Moment of Inertia	bh³	12	In.4	16149.87 1502.31	1.099		21089 06 1794 81		
20—Continued	Area Cross Section	4-hh		Sq. In.	419.25	1.049	i h	458 25		
1	Size Size Surfaced		or S4S	In.	19½x21¾			20x24 194x23}		
TABLE	60	Donah	ngnor!	In.	20x22			20x24		

									,
0.625	0.656	0.688	0.719	0.750	0.781	.813	844	.875	906
						<u> </u>	0	0	0
- <u>:</u>		106120 0.753 121 178	10124C 0.823 11C	96800 0.895 101	92699 0.971 93			: : ;	: : :
105222 0 560 132 176	100043 0.617 119	95242 0.677 108	90838 101240 0.740 0.823 99 110	86830 0.806 90	83127 0.874 83	79676 0.946 77			
93262 105222 0.498 0.560 117 132	88645 0.549 106	84364 0.602 96	80436 0.658 87	76860 0.716 80	73555 0.777 74	70474 0.840 68	67634 0.907 63	64969 0.974 58	
87282 0.467 109	82946 0.514 99	78925 0.564 90	75235 0.617 82	71875 0.672 75	68769 0.729 69	65873 0.788 63	63203 0.850 59	60697 0.913 54	58370 0.980 50
81302 0.435 102	77247 0.480 92	73486 0.527 84	70034 0.576 76	66890 0.627 70	63983 0.680 64	61272 0.735 59	58772 0.793 54	56425 0.852 50	54245 0.915 47
75322 0.404 94	71548 0.446 85	68047 0.489 77	64833 -0.535 71	61905 0.582 64	59197 0.632 59	56671 0.683 55	54341 0.737 50	52153 0.792 46	50120 0.850 43
69342 0.373 87	65849 0.411 78	62608 0.452 71	59632 0.494 65	56920 0.537 59	54411 0.583 54	52070 0.630 50	49910 0.680 46	47881 0.730 43	45995 0.784 40
63362 0.342 79	60150 0.377	57169 0.414 65	54431 0.453 59	51935 0.493 54	49625 0.534 50	47469 0.578 46	45479 0.623 42	43609 0.670 39	41870 0.719 36
57382 0.311 72	54451 0.343 65	51730 0.376 59	49230 0.411 54	46950 0.448 49	44839 0.486 45	42868 0.525 41	41048 0.567 38	39337 0.609 35	37745 0.653 33
- 00 CO 4	-0.8		350	325	-000	-25	- 0 to	010	
10.2	10.7	11.2	11.7	12.3	12.8	13.3	13.8	14.3	14.8
30	21	22	23	24	25	26	27	28	29
				120.92	1.047				
				21089.06 1794.81	1.070	-			
				00 1	m				
				21089.	1.093				
				458.25	1.047				
				193x233		_			
				20x24					

(Table 20 Continued on Next Page.)

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20-02
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E 20-0
0-06
LE 20—C

Deflection tion equivalent to 1/32 Inch per	Foot of Span	Q	·ln.	0.938	696 0	1 000	1.031	1.063	1.094	
		0006	WWY.	. '		,				1.07 0.98 1.02
flections		1800	noer -					:		1 07 0 98 1 02
um De		1600	TOWN							1 07 0 98 1 02
Maxim in Pou		1500	DATE T	:::					:	1 07 0 98 1 02
ls, and Stresses		1.500	0021	52206 0 980 44						1 07 0 98 1 02
Total Safe Loads in Pounds, and Maximum Deflections in Inches for Unit Stresses in Pounds per Square Inch, as indicated		1300	O O O	48218 0.910 40	46420 0 971 37	:	_		:	1 07 0 98 1 02
loads in		1900	0077	44230 0.840	42561 0 896 34	41000 0.956 32	: .			1 07 0 98 1 02
Safe I		1100		40242 0 770 34	38702 0.822 31	37261 0.876 29	35897 0 931 27	34590 0 988 25	:::	1 07 0 98 1 02
Total		0001	0001	36254 0.700 30	34843 0 747 28	33522 0 796 26	32271 0 846 24	31080 0 899 23	29960 0.952 21	1.07 0.98 1.02
Refer-	Num- ber			H 6100	÷ 0100	0100	→ 0100	0100	-075	H 63 4
Ratio of Span to to		q/2		15 3	<u>10</u>	16 3	16 9	17.4	17.9	Multiplying Factor
66.7	The de		Ft.	R	50	55	Ħ	7.	35	Multi
Weight ner Lineal Foot (Based	Green Timber	lbs. per cu. ft.)	Lbs.			3	1 047			
Section Modu- lus	* 1 / J	9	In.			3	1 070			
Moment cf Inertia	bh³		In.1				1.047 1.093 1.070			
Area Cross Section	11		Sq. In.			1	1.047			
521ZG	Surfaced	or S4S	In.				20024 1937233			
V2	Boneh	200	In.	ar very department			70724		-	

0.563	0.594	0.625	0 656	0 688	0.719	0.750	0.781	0.813	
		:			95061 107321 119581 0 607 0 682 0 758 95 108 120	114290 0.824 110	98222 109500 0.806 0.896 91 101	94149 104989 0.871 0.968 84 93	
			0.568 130 130 182	99593 112403 0.554 0.624 104 118	107321 0.682 108	90802 102546 1 0.660 0.742 87 99	98222 0.806 91	94149 0.871 84	
	116196 0 414 141 179	0 458 127	9796× 104683 118113 0 474 0 505 0.568 108 115 130		95061 0 607 95	90802 0.660 87	86944 0.716 80	83309 0.774 74	
115059 0.348 148 177	108778 0 388 132	96020 103066 0 401 0 430 111 119		93188 0.520 98	98931 0 569 89	84930 0 618 82	81305 0 672 75	77889 0 726 69	
99403 107231 115059 0.302 0.325 0.348 127 138 148 154 165 177	93942 101360 108778 0 336 0 362 0 388 114 123 132	96020 0 401 111	91253 0 442 100	\$6783 0 485 91	82801 0 531 83	79058. 0.577	75666 0.627 70	72469 0.678 64	
99403 0.302 127 154		88974 0 374 103	84538 0 411 93	80378 0 451 84	76671 0 493 77	73186 0.536 70	70027 0.582 65	67049 0.629 59	
91575 0.278 117 142	86524 0 310 105	81928 0.344 94	77823 0.379 86	73973 0.415 78	70541 0.455 71	67314 0.495 65	64388 0.537 59	61629 0.581 55	ge.)
83747 0.255 107 130	79105 0.284 96	74882 0 315 86	71108 0 348 78	67568 0 381 71	64411 0.417 65	61442 0 454 59	58749 0.493 54	56209 0 532 50	xt Pa
75919 0.232 97 118	71688 0.258 87	67836 0 286 78	64393 0.316.	61163 0.347 64	58281 0.379 59	55570 0.412 53	53110 0.448 49	50789 0.484 45	on Ne
₩ 63 62 44	H 21 cc 4	- 0100	- c1 cc 4	T 67 63	H 63 65 4	~720	-000		tinued
									1 8
'X 'Ω	œ. 6.	7 6	6.0	10.4	10.8	11.3	11.8	13.2	20 Co
	8.9					24 11.3		26 12.2	(Table 20 Continued on Next Page.
<i>'</i> ''.	∞ 	<i>a</i>	c.	10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	131.20 1.046 22 10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	131.20 1.046 22 10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	96944 74 2113,31 131,20 1 086 1 065 1,046 22 10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	197 25 198944 74 2113.31 131.20 1 046 1 086 1 065 1.046 22 10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	197 25 198944 74 2113.31 131.20 1 046 1 086 1 065 1.046 22 10.			.11	13	(Table 20 Co
<i>'</i> ''.	∞ 	<i>a</i>	c.	25 26984 74 2113.31 131.20 46 1 086 1 065 1.046 22 10.			.11	13	(Table 20 Co

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For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32	Foot of Span	Q	lυ.	0.844	0.875	906.0	0.938	0.969	1.000	1.031
ages (. 11.		0000	2000							
e see I	flection		1000	1000	90419 0.940 77			: : :			
is tabl	um De		1000	1001	79979 0.835 68	76855 0.898 63	73955 0.963 59				
n of th	Maxin s in Pou		1500	0001	74759 0.783 64	71822 0.842 59	69095 0.903 55	66533 0.967 51			
lanatio	ds, and Stresse		1400	1400	69539 0.731 59	66789 0.786 55	64235 0.843 51	61835 0.902 48	59589 0.964 44		
ıll exp	Loads in Pounds, and Maximun De Inches, for Unit Stresses in Pounds per Sonare Inch, as indicated		1900	00001	64319 0 679 55	61756 0.730 51	59375 0.783 47	57137 0.838 44	55042 0.895 41	53159 0.954 38	
For fu	Loads i		1900	1200	59099 0 626 51	56723 0.674 47	54515 0.722 43	52439 0.773 40	50495 0.826 38	48753 0.882 35	46922 0.935
	l Safe	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		0011	53879 0 574 46	51690 0.618 43	49655 0.662 40	47741 0.709 37	45948 0.757 34	44347 0.806 32	42651 0.858 30
			1000		48659 0 522 42	46657 0.561 38	44795 0.602 36	43043 0.644 33	41401 0.688 31	39941 0.733 29	38380 0.780
	Refer-	Num- ber	1		F- 21 00	C3 CO	-0100	-0160	-0000	-03.00	61 cc
	Ratio of Span to	of Surfaced Timber	1/p		12.7	13.2	13.6	14 1	14.6	15.1	5.5
	5	The contract of the contract o		Ft.	57	58	29	30	31	32	500
	Weight per Lineal Foot (Based	Green Timber at 38	lbs. per cu. ft.)	Lbs.				131 20			
	Section Modu- lus	S S	9	In.3				1.065			
nued.	Moment of Inertia	bh³	12	In.4			-	26044 74 2113 31 1.086 1.065	_		
-Continued	Area Cross Sertion	A=bh		Sq. In.		_		1 046	,		
20	Size	Surfaced		In.				19}x251			
TABLE	SC.	Rough		In.		-		20x26			

1.063	1.094	1.125		0.594	0.625	0.656	0.688	0.719	
			1.07 0.98 1.02						-
			1.07 0.98 1.02					124960 0.632 116 179	
			1 07 0.98 1.02		120050 128242 0.399 0.425 129 137	121829 0.468 124	116008 0.514 113	96468 103591 110714 0.492 0.527 0.562 90 97 103	-
			1.07 0.98 1.02	126611 0.359 143 181	120050 0.399 129	114029 0.439 116	. 0.450 0.483 0.514 98 106 113	103591 0.527 97	
: :			1 07 0.98 1.02	0.336 0.336 133 169	0.375 0.375 12(98429 106229 114029 121829 0.380 0.410 0.439 0.468 101 108 116 124	101118 0.450 98		
1 1 1			1.07 0.98 1.02	109371 0.312 123 157	103666 0.345 111		93673 0.418	89345 0.457 83	
45291 0.993			1 07 0 98 1 02	100751 0.287 114 145	95474 0.319 102	90629 0.351 93	86228 0.386 84	82222 0.422 77	ge.)
41145 0.911 28	39728 0.966 26		1 07 0.98	92131 0.264 104 133	87282 0.292 94	82829 0.322 85	78783 0.354 77	75099 0.386 70	ext. Pa
36999 0.828 25	35699 0.877 24	34387 0 928 22	1.07	83511 0.240 94 121	79090 0.266 85	75029 0.293 77	71338 0.322 69	67976 0.351 63	on Ne
-0100		-0100	H 23 44	-0004	H01004	~ 61 €	- 01 60	-0.004	tlnued
16.0	16.5	16.9	Multiplying Factor	80.33	8 7	61	9.6	10.0	(Table 20 Continued on Next Page.
248	35	36	Multi	19	20	5	22	23	(Table
	131 20	1.046			141.50	1 044	~		
	2113.31	1.065	10,000		2457.81	1.063			
-	26944.74	1.086			33794.90 2457.81	1.083			
	497.25	1 046			536.25	1.044			
	19½x25½				19½x27½				
	0x26				20x28				

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	Deflec- tion equiv- alent to 1/32 Inch per Foot of	Q	ln.	0.750	0.781	0,813	0.844	0.875	906 0	
			2000		127521 0.830 109 183	0.897	0.968 0.968 93			
	Aections		1800	98949 105772 119418 0.573 0.612 0.688 88 95 107	94756 101309 114415 127521 0.622 0.664 0.747 0.830 81 87 98 109 183	97121 109721 122321 0.718 0.807 0.897 80 90 101	93236 105368 117500 0.774 0.872 0.968 74 84 93	89655 101357 0 833 0 937 69 78		
i	Total Safe Loads in Pounds, and Maximum Deflections in Inches, for Unit Stressee in Pounds per Square Inch, as indicated		1900	105772 0.612 95	101309 * 0.664 87	97121 0.718 80	93236	89655 0 833 69	862.52 0 893 64	
			1500			90821 0.673 75	81104 87170 0.678 0.726 64 69	83804 0 781 64	80633 0.837 60	
			1400	92126 0 535 82	88203 0.581 76	88203 0.581 76 84521 0.628		77953 0 725 60	74984 0.782	
	n Poun or Unit juare In		1300	85303 0.497 76	81650 0.539 70	78221 0.583 64	75038 0.629 60	72102 0 677 55	69335 0 725 51	
	Loads i nches, f		1200	78480 0.459 70	75097 0.498 64	71921 0.538 59	68972 0.581 55	66251 0 625 51	63686	
1	al Safe		001%	71657 0.420 64	68544 0.456 59	65621 0.493 54	62906 0 532 50	60400 0 572 46	58037 0.614 43	
	Tota		1000	64834 0.382 58	61991 0.415 53	59321 0.449 49	56840 0.484 45	54549 0 520 42	52388 0.558 39	
	Reference Num-	-0100		-0100	~~~~	c1 co	-0100			
	Ratio of Span to Depth of Surfaced Timber			10.5	10 9	E	E .	21 21	<u>등</u> 1~	
	Span		- E.	24	25	26	27	S.	65	
	Weight per Lineal Foot (Based on Circen Timber at 38 lbs. per cu. ft.)		Lbs.	_		141 50	1 044			
	Section Modu- lus	S=6	jn.8			2457 81	1 063			
	Moment of Inertia	i= bh³	In.4	1.083 1 0						
	Area Cross Section	A=bh	Sq. 1n.				1.044			
	Size	Surfaced S1S1E or S4S	In.			192x273				
THE PARTY OF THE P	S2	Rough	j.			20x28				

0.938	0,969	000.1	1.031	. 063	094	1.125	1.156	1.188		
<u>.</u> .				:	: : :	: .	- : . - : . - : -		1.06	
									1 06 0.98 1.02	
83117 0 956 59				:				:::	1.06 0.98 1.02	
77657 0 896 55	74843 0.957 52	::::				-	-:::		1.06 0.98 1.02	
72197 0.836 52	69561 0.893 48	67138 0.952 45	: : :	::.	• : .			:	1.06 0.98 1.02	
0 777 0 777 48	64279 0.830 441	62019 0.883 42	59850 0.939 39	57837 0.998 36					1.06 0.98 1.02	
61277 0 717 44	5899, 0 766 41	56900 0 816 38	54887 0.867 36	53018 0.921 33	51221 0.976 31				1.06	(i
55817 0 657 40	53715 0.702 37	51781 0.748 35	49924 0.795 32	48199 0.844 30	46540 0.895 29	44957 0.946 27	43484 1.000 25		1.06	t Page
50357 0.597 36	48433 0.638 33	46662 0.680 31	44961 0.723 29	43380 0.767 27	41859 0.813 26	40407 0.860 24	39055 0.909 23	37723 0.958 21	1.06	on Nex
— 21 m	- 01 00	H 0100	- 03 50	H 01 00	0.1 tb	1 2 8	-26	357	124	inned
13.1	13.5	14.0	14.4	14.8	15.3	15.7	16.1	16.6	Multiplying Factor	Table 20 Continued on Next Page.
8	150	22	88	Ť¢.	35	36	37	38	Multi Fac	(Table
				141.50	1.044		_			
	1.063									
				33794.90	1.083					
~	-			536.25 3	1.044			-		
					_					
				192x272						
				20x28						

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THE WEST COAST LUMBERMEN'S ASSOCIATION

For full explanation of this table see pages 68 to 70.	Deflection equivalent to 1/32 Inch per	Foot of Span	D	ln.	0.625	0.656	0.688	0.719	0.750
ages 6		2000		: 1			• • •	:	
see b	fections		1800				: : :		98460 106314 114168 122022 137730 0.463 0.499 0.344 0.570 0.641 115 82 89 95 102 115 184
s table	um Def		1600			::	133668 0.479 122 179	127645 0.524 111	122022 0.570 102
of thi	Maxim in Pou	1500		138279 0 371 138 184	131482 0 410 125	125105 0 449 114	119449 0.491 104	114168 0 534 95	
mation	ls, and Stresses ch, as in		1300 1400		128858 0 346 129 172	122504 0.382 117	116542 0.419 106	0.458 97	106314 0 499 89
il expla	in Pounds, and Maxim for Unit Stresses in Pou Square Inch, as indicated				91174 (10595 110016 119437 128858 138279 0 247 0 272 0 297 0 322 0 346 0 371 91 101 110 119 129 138 123 135 148 160 172 184	95570 104548 113526 122504 131482 0.300 0.327 0.355 0.382 0.410 91 100 108 117 125	99416 107979 116542 125105,133668 0.359 0.389 0.419 0.449 0.479 90 98 106 114 122	9.4861 103057 111253 119449 127645 0.383 0.426 0.458 0.491 0.524 82 90 97 104 111	98460 0.463 82
For ful	Total Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1200		0 297 110 110 148	104548 0.327 100		94861 0.393 82	90606
			1100		0.272 0.272 101 135	95570 0.300 91	90853	86665 0.360 75	82752 0.392 69
			1000		91174 0.247 91 123	86592 0.273 82	82290 0.299 75	78469 0.327 68	74898 0.356 62
	Reference Num- ber				12254	- 57 co	-0.64	02 00	-004
	Ratio of Span to Depth of Surfaced Timber				8 1	00 00	0 6	9.4	· 80
				Ft.	20	21	22	23	24
	Weight per Lineal Foot (Based on Green Timber at 38 lbs. per cu. ft.)			Lbs.		A	151.80		
	Section Modu- lus	S—bh²		In.3			1 061		
nued.	Moment of Inertia	1=		In.4			41717.62 2828.31 1 078 1 061		
20-Continued	Area Cross Section	A=bh		Sq. In.			1 043		
	Size	Surfaced	or S4S	In.			20x30 19½x29½		
TABLE	₩.	-	Rougn	In.			20x30		
L				-					

PACIFIC COAST WOODS

0.781	0.813	0 844	0.875	906.0	0.938	0.969	000	1.031	1.063
31909 0.696 106		100602 107582 121542 125502 0 677 0 722 0 812 0 903 75 80 90 100 182	0.728 0.776 0.874 0.971 69 74 84 93	0.937					
94214 101753 109292 116831 131909 0.503 0.542 0.580 0.619 0.696 775 81 87 93 106	0.585 0.627 0.669 0.752 75 81 86 97	0.722	0.776	99599 1 0.833 69	95944 0.890 64	92576 0.952 60			
0.580	0.627	100602 0.677 75		93099 0.781 64	89663 0.835 60	86496 0.892 56	83463 0.950 52		
0.542 81	97525 0.585 75	93622 0.632 69	89998 0.679 64	86599 0.729 60	83382 0.779 56	80416 0.832 52	77575 0.886 48	74974 0.944 45	
	90277 0.544 69	86642 0.586 64	83266 0.631 59	80099 0.677 55	77101 0.724 51	74336 0.773 48	71687 0.823 45	69261 0.876 42	66912 0.930 39
86675 0.464 69	83029 0.502 64	79662 0.542 . 59	76534 0.582 55	73599 0.624 51	70820 0.668 47	68256 0.714 44	65799 0.760 41	63548 0.809 39	61368 0.858 36
79136 0 425 63	75781 0.460 58	72682 0.497 54	69802 0.534 50	67099 0.572 46	64539 0.612 43	62176 0.654 40	59911 0.697 37	57835 0.742 35	55824 0.787 33
71597 0.387 57	68533 0.418 53	65702 0.451 49	63070 0 485 45	60599 0.520 42	58258 0.556	56096 0.595 36	54023 0.634 34	52122 0.674	50280 0.715 30
- 24 65	120	H264	225	-250	327			-000	
10.2	10.6	11.0	11.4	11.8	12.2	12.6	13.0	13.4	13.8
25	26	27	58	29	30	31	32	33	34
				151.80	1.043				
				2828.31	1.061				
				67	1.078				
				5.25	1.043				
				19½x29½					
				20x30					

(Table 20 Concluded on Next Page.)

	-									
For full explanation of this table see pages 68 to 70.	Deflec- tion cquiv- alent to 1/32 Inch per	Span	Д	In.	1.094	1.125	1.156	1.188	1.219	
ages 6			. 0006	0000						1.06
e see I	Bections		1000	1000						1.06
is tabi	um Dei		1600	0001			:			1.06
or th	Maximi in Pour dicated		1 200							1.06
anation	s, and Stresses		1400				-		: :	1.06
II expr	Tetal Safe Loads in Pounds, and Maximum Deffections in Inches, for Unit Stresses in Pounds per Square Inch, as indicated		1900		64668 0.985 37		:			1.06
For fu	oads in ches, fo		1900		59285 0.909 34	57382 0.963 32				1.06
	Safe I		1100		53902 0.833 31	52145 0.882 29	50429 0.932	48794 0.982		1.06
	Tetal		1000	0001	48519 0.758 28	46908 0.802 26	45334 0.847 25	43834 0.893 23	42401 0.941 22	1.06
1	Refer-	per -			-0100	- c3 co	-0122	# 21 E	-00	-04
	Ratio of Span to Depth		4/ <i>/</i> 2		14.2	14.6	1.01	12	15.9	Multiplying
	Span			Ft.	10	36	37	× **	39	Multip
	Weight per Lineal Foot (Based on	Timber at 38	lbs. per cu. ft.)	Lbs.			151.80	1.043		
	Section Modu- lus	S	9	In.3			15. 25. 31	1.061		
nued.	Moment of Inertia	bh3	12	1p.4			575 25 (41717 62 2×2× 31	1.078		
-Continued	Area Cross Section	A==bh		Sq. In.			575 25 1	1.043		
20	725		or S4S	In.	,		9½x29½			
LABLE	Ĭ,	Rough		In.			20x30 19½x29½			

SAFE TOTAL LOADS FOR BEAMS, LIMITED BY HORIZONTAL SHEAR—ALSO SAFE VERTICAL SHEAR

Table 21 has been computed to show the safe loads on beams determined by the resistance to horizontal shear. Shearing values varying from 100 to 225 pounds per square inch have been used and are computed for beams surfaced S1S1E or S4S. If desirable to find the corresponding values for full size beams (rough) multiply loads in any horizontal line in the table by the factor given in bold face type in the column headed "Multiplying Factor."

Example: To find the load on a 12"x18" rough timber limited by a horizontal shear of 100 pounds per square inch. The table shows such a load to be 26,830 pounds for a beam surfaced to standard size. Multiply 26,830 by 1.07, shown in bold face type in the column headed "Multiplying Factor," and the limiting load required for a full size timber is found to be 28,710 pounds.

SAFE LOADS IN POUNDS UNIFORMLY DISTRIBUTED FOR DOUGLAS FIR BEAMS—DETERMINED BY RESISTANCE TO HORIZONTAL SHEAR

Safe Load in pounds =
$$W = \frac{Jbh}{0.75}$$
, shown in light face type. Also

SAFE VERTICAL SHEAR IN POUNDS FOR DOUGLAS FIR BEAMS—DETERMINED BY RESISTANCE TO HORIZONTAL SHEAR

Safe Vertical Shear in pounds $=\frac{W}{2}=V=\frac{Jbh}{1.50}$, shown in italics.

Values in this table are based on surfaced sizes. To get values for rough sizes, multiply factor for any given size by number in bold face type.

TABLE 21

* See page 34

	Size		Total S Ho	afe Loads	and Safe	Vertical Sounds per	Shear in H	ounds Li	mited by
Rough	Surfaced S1S1E or S4S	Multi- plying Factor	. 100	R. R. 120* Struct- ures	125	Highway 150* Struct-	Pro- tected 175* Struct-	200	225
In.	In.			ures		ures	ures		
2x 4	15 8X 35 8	1.36	785 393	942 471	981 491	1178 589	1374 687	1570 785	1766
2x 6	15 sx 55 8	1 31	1219 610	1463 732	1524 762	1828	2133	2438	883 2743
2x 8	15 sx 71 2	1 31	1625 813	1950	2031	914 2438	1067 2844	1219 3250	1372 3656
2x10	15 8X 91 2	1 30	2059 1030	975 2470	1016 2574	1219 3089	1423 3603	1625 4118	1828 4633
2x12	15/8×111/2	1.29	2491	1235 2990	1287 3114	1545 3737	1803 4359	2059 4982	2317 5605
2x14	15/8x131/2	1.28	1246 2925	1495 3510	1557 3656	1869 4388	2180 5119	2491 5850	$\frac{2803}{6581}$
2x16	15/8x151/2	1.27	1463 3359	1755 4030	1828 4199	2194 5039	2560 5878	2925 6718	3291 7558
2x18	15/8x17½	1.27	1680 3791 1896	2015 4550 2275	2100 4739 2870	2520 5687 2844	2939 6634 3317	3359 7582 3791	3779 \$530 4265
3x 6	2½x 5½	1.31	1834	2200	2293	2751	3210	3668	4127
3x 8	2½x 7½	1.28	917 2500	1100 3000	1147 3125	1376 3750	1605 4375	1834 5000	2064 5625
3x10	2½x 9½	1.26	1250 3168	1500 3800	1563 3960	1875 4752	2188 5544	2500 6336	2813 7128
3x12	2½x11½	1.25	1584 3833	1900 4600	1980 4791	2876 5750	2772 6708	3168 7666	3564 8624
3x14	2½x13½	1.25	1917 4500	2300 5400	2396 5625	2875 6750	8354 7875	<i>9000</i>	4312 10125
3x16	2½x15½	1.24	2250 5167	2700 6200	2813 6459	3373 7751	3938 9042	10334	5063 11626
3x18	2½x17½	1.23	2584 5835 2918	3100 7000 3500	3230 7294 3647	3876 8753 4377	4521 10211 5106	5167 11670 5885	5813 13129 6565
4x 4	3½x 3½	1.31	1633	1960	2041	2450	2858	3266	3674
4x 6	3½x 5½	1.25	817 2567 1284	980 3080 1540	1021 3209 1605	1225 3851 1926	1429 4492 2246	1633 5134 2567	1837 5776 2888
				4040	2000	1020	2240	2007	2000

(Table 21 Continued on Next Page.)

PACIFIC COAST WOODS

TABLE 21—Continued.

	Size		Total S Ho	afe Loads rizontal Sl	and Safe hear in Pe	Vertical Sounds per	Shear in 1 Square In c	Pounds Li ch as Indi	mited by
Rough	Surfaced S1S1E or S4S	Multi- plying Factor	100	R. R. 120* Struct- ures	125	Highway 150* Struct- ures	Pro- tected 175*	200	225
In.	In.			ures		ures	Struct- ures		
4x 8	3½x 7½	1.22	3500 1750	4200 2100	4375 2188	5250 2625	6125 3063	7000 3500	7875 3938
4x10	3½x 9½	1.20	4432 2216	5320 2660	5540 2770	6648	7756 3878	8864	9972
4x12	3½x11½	1.19	5368 2684	6440 3220	6710 3355	8052 4026	9394 4697	4432 10736	4986 12078
4x14	3½x13½	1.19	6300 3150	7560 3780	7875 3938	9450	11025	5368 12600	6039
4x16	3½x15½	1.18	7234	8680	9043	4725 10851	5513 12660	6300 14468	7088 16277
4x18	3½x17½	1.18	3617 8165 4083	4340 9800 4900	4522 10206 5103	5426 12248 6124	6330 14289 7145	7234 16330 8165	8139 18371 9186
6x 6	51 2x 51 2	1 19	4067	4880	5084	6101	7117	8134	9151
6x 8	51 2X 71 2	1 16	2034 5500	2440 6600	2542 6875	3051 8250	3559 9625	4067 11000	4576 12375
6x10	51 2X 91 2	1.15	2750 6965	3300 8360	3438 8706	4125 10448	4813 12189	5500 13930	6188 15671
6x12	5½x11½	1.14	3483 8435	4180 10120	4353 10544	5224 12653 6327	6095 14761	16870	7836 18979
6x14	5½x13½	1.13	4218 9900 4950	5060 11880 5940	5272 12375 6188	14850 7425	7381 17325 8663	8435 19800 9900	9490 22275 11138
6x16	5½x15½	1.13	11366 5683	13650 6825	14208 7104	17049 8525	19891 9946	22732 11366	25574 12787
6x18	5½x17½	1.12	12835 6418	15400 7800	16044 8022	19253	22461 11231	25670 12835	28879 14440
6x20	5½x19½	1.12	14300 7150	17160 8580	17875 8938	21450 10725	25025 12513	28600 14300	32175 16088
8x 8	7½x 7½	1.14	7500 3750	9000 4500	9375 4688	11250 5625	13125 6563	15000 7500	16875 8438
8x10	7½x 9½	1.12	9500 4750	11400 5700	11875 5938	14250 7125	16625 8313	19000 9500	21375 10688
8x12	7½x11½	1.11	11500 5750	13800 6900	14375 7188	17250 8625	20125 10063	23000 11500	25875 12938
8x14	7½x13½	1.11	13500 6750	16200 8100	16875 8438	20250	23625 11813	27000 13500	30375 15188
8x16	7½x15½	1.10	15500 7750	18600 9300	19375 9688	23250 11625	27125 13563	31000 15500	34875 17438
8x18	7½x17½	1.10	17500 8750	21000 10500	21875 10938	26250 13125	30625 15313	35000 17500	39375 19688
8x20	7½x19½	1.09	19500 9750	23400 11700	24375 12188	29250 14625	34125 17063	39000 19500	43875 21938
10x10	9½x 9½	1.11	12037 6019	14450 7225	15046 7523	18056 9028	21065 10533	24074 12037	27083 13542
10x12	9½x11½	1.10	14568 7284	17490 8745	18210 9105	21852 10926	25494 12747	29136 14568	32778 16389
10x14	9½x13½	1.09	17100 8550	20520 10260	21375 10688	25650 12825	29925 14963	34200 17100	38475 19238
10x16	9½x15½	1 09	19640 9820	23570 11785	24550 12275	29460	34370 17185	39280 19640	44190 22095
10x18	9½x17½	1.08	22170 11085	26600 13300	27713 13857	14730 33255 16628	38798 19399	44340 22170	49883 24942
10x20	9½x19½	1.08	24700 12350	29640 14820	30875 15438	37050 18525	43225 21613	49 100 24700	55575 27788

(Table 21 Concluded on Next Page.)

TABLE 21—Continued.

LABL	E 21-0	ontinu	eu.						
	Size					Vertical Sounds per			imited by
Rough In.	Surfaced S1S1E or S4S In.	Multi- plying Factor	100	R. R. 120* Struct- ures	125	Highway 150* Struct- ures	Protected 175* Structures	200	225
12x12	11½x11½	1.09	17640	21160	22050	26460	30870	35280	39690
12x14	11½x13½	1.08	8820 20700	10580 · 24830	11025 25875	13230 31050	$\frac{15435}{36225}$	17640 41400	19845 46575
12x16	11½x15½	1.08	10350 23770	12415 28520	12938 29713	15525 35655	18113 41598	20700 47540	23288 53483
12x18	11½x17½	1.07	11885 26830	14260 32200	14857 33538	17828 40245	20799 46958	23770 53660	26742 60368
12x20	11½x19½	1.07	13415 29900 14950	16100 35890 17945	16769 37375 18688	20123 44850 22425	23479 52325 26163	26830 59800 29900	30184 67275 33638
14x14	13½x13½	1.08	24300 12150	29170	30375	36450	42525	48600	54675
14x16	13½x15½	1.07	27900	14585 33490	34875	18225 41850	21263 48825	24300 55800	27338 62775
14x18	13½x17½	1.07	13950 31500 15750	16745 37800 18900	17438 39375 19688	20925 47250 23625	24413 55125	27900 63000	31388 70875
14x20	13½x19½	1.06	35100 17550	42110 21055	43875 21938	52650 26325	27563 61425 30713	31500 70200 35100	35438 78975 39488
16x16	15½x15½	1.07	32030	38430	40038	48045	56053	64060	72068
16x18	15½x17½	1.06	16015 36170 18085	19215 43400 21700	20019 45213 22607	24023 54255 27128	28027 63298 31649	32030 72340 36170	36034 81383 40692
16x20	15½x19½	1.06	40300 20150	48350 24175	50375 25188	60450 30225	70525 35263	80600	90675
16x22	$15\frac{1}{2}x21\frac{1}{2}$	1.06	44420 22210	53300	55525	66630	77735	40300 88840	45338 99945
16x24	15½x23½	1 05	48580 24290	26650 58270 29135	27763 60725 30363	33315 72870 36435	38868 85015 42508	44420 97160 48580	49973 109305 54653
18x18	17½x17½	1.06	40820 20410	48990 24495	51025 25513	61230 30615	71435 35718	81640 40820	91845
18x20	17½x19½	1.06	45500	54600	56875	68250	79625	91000	45923 102375
18x22	$17^{1}{_{2}\rm X}21^{4}{_{2}}$	1.05	22750 50180 25090	27300 60200 30100	28438 62725 31363	34125 75270 37635	39813 87813 43903	45500 100360 50180	51188 112905 56453
18x24	$17_{2}^{1}\mathrm{2x}23_{-2}^{+}$	1.05	54810	65800	68513	82215	95918	109620	123323
18x26	$17^{1}{_{2}\rm{x}}25^{4}{_{2}}$	1.05	27405 59500 29750	32900 71400 35700	34257 74375 37188	41108 89250 44625	47959 104125 52063	54810 119000 59500	61662 133875 66938
20x20	$19^{1}_{/2}\chi19^{1}_{/2}$	1 05	50700 25350	60820 30410	63375 31688	76050 38025	88725	101400	114075
20x22	$19^{1}_{2} \chi 21^{1}_{2}$	1 05	55880	67070	69850	83820	44363 97790	50700 111760	57038 125730
20x24	$19^{1}{_{2}\rm X}23^{4}{_{2}}$	1 05	27940 61080 30540	33535 73300 36650	34925 76350 38175	41910 91620 45810	48895 106890 53445	55880 122160	62865 137430
20×26	$19^{4}_{23}25^{3}_{2}$	1 05	66270	79550	82838	99405	115973	61080 132540	68715 149108
20x28	19 ¹ 2x27 ¹ 2	1 04	33135 71460	39775 85750	41419 89325	49703 107190	57987 125055	66270 142920	74554 160785
20x30	191/2×291/2	1 04	35730 76680 38340	42875 92000 46000	44663 95850 47925	53595 115020 57510	62528 134190 67095	71460 153360 76680	80393 172530 86265
					, , , ,		0,000	10000	00200

MAXIMUM SPANS AND MAXIMUM DEFLECTIONS FOR MILL AND LAMINATED FLOORS

Tables 22 and 23 show the maximum spans for both mill and laminated floors limited by safe fiber stresses varying from 1,200 to 1,800 pounds per square inch. and by floor loads varying from 50 to 1,000 pounds per square foot. The maximum deflections in inches are also given for each span length shown. The dimensions of flooring given are standard as manufactured by the West Coast Lumbermen's Association. The weight of the floor has been added to the live load in computing the spans and deflections. A value of 1,643,000 pounds per square inch for the modulus of elasticity was used in computing deflections in mill and laminated floors.

DED	lections		1000	1900			7' 3"	.8122	6530.			9, 6	.9480	8, 1	.6865	.6043	.5398	6, 2,	.3999	3476
LOAI	mum Def	icated	1600	1000		7'10"	.8420	6, 2,	.5230		10' 0"	.9328	.7562	7' 7"	.5366	.4801	.4255	5/10"	.3175	2740
UNIFORMLY LOADED	Maximum Spans in Feet and Maximum Deflections in Inches, for Safe Fiber Stresses in	In., as ind	1500	0061		7, 7"	6' 7"	5'11"	.4511		9, 8,,	.8187	.6580	7' 4"	4702 6'11"	.4191	3695	3331	.2809	2410
UNIF	in Feet s, for Safe	s per Sq.	1400	7.400	8'11"	7, 4"	6, 5"	5' 9"	.3975	10, 9"	9, 4"	8, 5,	7, 8"	7, 1"	.4099	.3635	.3280	.2940	2474	2112
OORS izes.	in Spans	Found	1300	1000	8, 7"	7/ 1"	.5601	5' 6"	.3378	10' 4"	9, 0, 0, 0	8' 1"	4955	.4171	.3541	.3123	5′ 9″	5' 3"	.2091	1837
MILL FLOORS surfaced sizes.	Maximu		1900	000	%, 3,"	6/10"	5/11"	5' 4"	. 2930	9,11,6	/	7' 9"	4211	3520	.3037	5'10"	5, 7"	2186	.1815	1524
NS FOR MII based on sur	Combined Load Live and	Weight of Floor per sq. ft.	Γ,	Lbs.	106.02	156.02	206.02	256.02		158.85	208.85	258.85	308,85	358.85	408 85	458.85	508.85	608.85	708 85	2000
rior	Live Load	per Square Foot		Lbs.	100	150	200	250		150	200	250	300	350	400	450	200	009	700	
DEFLECTION This table	Weight per Square Foot	air-dry weight at 34 lbs. per	cu. ft.)	Lbs.		6 00	20.02		_	-					∞ ∞					-
AAXIMUM Values in	Section	S-S-6	b=12 In.	In.3		60 0	80.8								19 53					1
AND MA Va	Moment of Inertia	bh³	b=12 In.	In.4		0 60	00'8								30 52					-
SPANS	Area Cross Section	A=bh b=12 In.		Sq. In.		10°	0.04								37.5					
EMUM S	Floor Thickness	Surfaced S1S1E or	SES	In.		917	88 24								37.8			Man		
MAX	Floor T	Rough		In.		91%	24								22					

TABLE 22—Continued.

Maximum Spans in Feet and Maximum Deflections in Inches, for Safe Fiber Stresses in Pounds per Sq. In., as indicated	0 1800												1, 6, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,	
mum resses licated	1600												5/11"	-
and Maxi Fiber St (n., as inc	1500			11' 2"	10, 1"	9, 2, 6	8, 6,	8, 0,	7, 7"	7, 2, 2, 3889	6, 7,	6, 1,	5, 8, 2428	
in Feet 83, for Safe 3 per Sq. 1	1400			10'10"	9,8%	8/11"	8, 3% 8, 3%	7, 9"	7, 4"	6/11	6, 4"	5/11"	5, 6" 2134	
m Spans in Inchee Poundi	1300		11/11"	10, 5,	9, 4"	20.00	7/11"	7, 5"	7, 0, 1	6, 8,	6, 1,	5, 8,	5, 4" 5, 4" 1862	
Maximu	1200		11, 6,	10, 0,	9,0%	0,4080	7, 8,	7, 2"	6, 9,	6, 5,	5/10"	5, 5,	5, 1,	0004.
Combined Load Live and Weight of Floor per sq. ft.	L'	Lbs.	160.27	210.27	260.27	310.27	360.27	410.27	460.27	510.27	610.27	710.27	810.27	
Live Load per Square Foot	F .	Lbs.	150	200	250	300	350	400	450	200	009	200	800	
Weight per Square Foot (Based on air-dry	34 lbs. per cu. ft.)	Lbs.							10.27	and ().				
Section Modulus bh?	6 b=12 In.	In.3							26.27					
Moment of Inertia	12 b=12 In.	In.4							47.63					
Area Cross Section	A=Dn b=12 In.	Sq. In.							43.5					
nickness Surfaced	SISIE or S4S	In.						_	325/8	_				
Floor Thickness	Kough	In.							*					

*Use this table for laminated floors of 2"x4" lumber.

MANIMUM SPANS AND MANIMUM LEFLECTIONS FOR LAMINATED FLOORS UNIFORMLY LOADED

Values in this table are based on surfaced sizes.

flections		1800					12' 9"	9500	.8657	.7180	.6239	.5460	.4825	.4390
mum De	icated	1600			13, 7"	.9580 12' 9"	.8444 12' 0"	7482	.6778	5727 9'9"	4940	4289	3830	3462
nd Maxii Fiber Str	n., as ind	1500		14' 2"	.9780	.8440	.7407	.6637	.5980	.5035	.4320	3801	.3381	3049
in Feet a	per Sq. I	1400		13, 8"	.8500	11,11,	.6458	.5759	9'10"	9' 1"	.3754	.3289	.2909	.2615
Spans in Inches	Pounds	1300		13, 2"	12, 3"	11, 6"	.0283	.4955 10' 4"	9, 2,	.3742 8′ 9″	3231	.2817	.2534	.2269
Maximum Spans in Feet and Maximum Deflections in Inches, for Safe Fiber Stresses in		1200		12' 8"	11, 9"	11, 0,	.4/16	9/11"	9, 1"	8' 5"	.2761	7' 5"	2142	.1955
Combined Load	Live and Weight of Floor	per Sq. Ft. L'	Lbs.	315.95	365.95	415.95	465.95	515.95	615.95	715 95	815.95	915.95	1015.95	
Iive Load	Square Foot		Lbs.	300	350	400	450	200	009	200	800	006	1000	
Weight per Square	(Based on air-dry	weight at 34 lbs. per cu. ft.)	Lbs.					200	66.61					
Section Modulus	bh²	S== 6 b=12 In.	In.3					89 99					_	
Moment of Inertia	pp3	In.4					177 09	00.				-		
Area (Yoss Section		A=bb b=12 In.	Sq. In.					10						
Floor Thickness	Surfaced	S4S	In.					100	00					
Floor T	Rough		In.					8						

PACIFIC COAST WOODS

							14'9"	9545	13, 8"	5200	12/10"	7220	12, 1"	6404	11' 6"	.5803									16, 2	9033	15, 3"	5043	14, 6"	.7280		
			15'11"	9879	15' 2"	8973	13/11"	7555	12'11"	6510	12, 1"	.5692	11' 5"	5086	10/10"	4574	 _	:	:	:	17' 6"	9422	16' 3"	8120	15, 3,	7142	14, 5,	6394	13, &	5750	-	
	16' 4"	9751	15' 5"	8683	14' 8"	7871	13' 6"	6661	12' 6"	5717	11, 8"	.4978	11' 1"	4491	10' 6"	.4030	:		18' 6"	. 9870	17, 0"	. 8339	15' 9"	7154	14' 9"	.6266	13/11"	5582	13, 3,	.5062		
16'10"	15' 9"	.8466	14/11"	.7589	14' 2"	. 6853	13, 0"	.5766	12' 1"	.4979	11' 4"	.4384	10' 8"	3882	10, 2"	.3529	18/10"	.9540	17/11"	8639	16, 2"	.7259	15' 3"	.6259	14' 3"	.5460	13, 6"	4908	12,10"	.4431		
16' 3"	15, 3"	. 7370	14' 5"	.6580	13' 8"	.5920	12' 6"	. 4955	11' 8"	.4319	10'11"	.3775	10, 3"	3330	8, 8,	.3011	18, 1"	8171	17, 3"	. 7438	15'10"	. 6262	14' 8"	.5380	13.9"	4720	13, 0"	. 4223	12' 4"	3801		
15' 7"	14' 7"	6220	13/10"	.5592	13' 2"	.5071	12' 1"	.4271	11, 2"	.3650	10, 6"	.3226	9/11"	2875	9, 2,,	.2596	17' 5"	7002	16, 7"	. 6345	15, 2"	. 5309	14' 1"	.4572	13, 3,	.4049	12' 6"	3605	11'10"	.3231		
371 25	421.25		471 25		521 25		621.25		721.25		821.25		921.25		1021.25		476.91		526.91		626.91		726.91		826.91		926.91		10.26.91			Next Page.
350	400		450		200		009	F	200		200		006		1000		450		200		009		700	0	200	0	006	000	1000			Concluded on
		_						21.25											_					26.91	_							Table 23 Cor
								112.50																180.50						_		(T8
								421 SS																857.38								
								0.06																114.0								
								6,12															i	9,3								
								s																10								

TABLE 23—Continued.

flections	1800				9700 17' 6" 8758		
mum De esses in icated	1600		19' 8"	. 9820 18′ 5″ . 8623	.6920 .6920	21' 6"	1.0000 20' 4" .8942 19' 4" .8080
nd Maxin Fiber Str n., as indi	1500		20' 5" .9939 19' 0"	.8594 17'10° .7579	.6751 16' 0' 16' 0'	20'10"	.8800 19' 8" .7843 18' 9"
in Feet a , for Safe per Sq. I	1400		19' 9" .8669 18' 4"	. 7466 17' 3" . 6621 . 16' 2"	.5877	21' 5" .8683 20' 2"	.7700 19' 0'' .6836 18' 1'' .6184
Maximum Spans in Feet and Maximum Deflections in Inches, for Safe Fiber Stresses in Pounds per Sq. In., as indicated	1300		19' 0" .7455 17' 8"	. 5441 16' 7" . 5680 . 5680	.5069 14'11" .4598	20' 8" .7503 19' 5"	.6631 18′ 4″ 5909 17′ 5″ .5338
Maximu	1200		18' 4" .6404 17' 0"	15/11"	.4339 14' 4" .3919	19'10" .6381 18' 8"	.5760 17' 8" 5063 16' 9" 4552
Combined Load Live and Weight of Floor	per Sq. Ft.	Lbs.	632.59	832 59		738.25	938.25
Live Load Per Square Foot		Lbs.	009	800	1000	900	1000
Weight per Square Foot (Based on	weight at 34 lbs. per cu. ft.)	Lbs.		32 59			7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.
Section Modulus bh²	6 b=12 In.	In.3		264.50			00 400
Moment of Inertia	12 b=12 In.	In.4		1520 88		0400 90	00 0047
Area Cross Section	A=bh b=12 In.	Sq. In.		138.0		0 601	102.0
78 13	S4S	In.		1112		101	1000
Floor T		In.		57		7	**

MAXIMUM BENDING OR RESISTING MOMENTS OF CROSS SECTION IN FOOT POUNDS FOR RECTANGULAR BEAMS

Table 24 shows the maximum resisting moments in foot pounds for timbers varying in size from 2"x4" to 20"x30" for safe fiber stresses varying from 1,000 to 2,000 pounds per square inch. The values given are for surfaced sizes. Multiplying factors are given which enable the values to be quickly converted to those for rough timbers full size.

MANIMUM BENDING OR RESISTING MOMENTS OF CROSS SECTION IN FOOT POUNDS FOR REC-TANGULAR BEAMS

To get values for rough sizes, multiply Resisting Moment for any given size by multiplying factor in bold face in same horizontal line. Values in this table are based on surfaced sizes.

	2750		Resisting	ne Moment	Moments in Foot Pounds for	ounds for Sa	Safe Fiber Str	Stresses in Pou	Pounds per So.	So. In., as ind	indicated
Rough	Surfaced	Multiplying		0							
	or S4S		1000	1100	1900	1300	1400	1500	1600	1800	2000
In.	In.		1000	2007	007	0001	YXX	0004	2004	2004	
2x 4	15/x 35/c	1.50	297	327	356	386	416	446	475	535	594
9 x 6	15 cx 35 x	1.40	714	785	857	928	1000	1071	1142	1285	1428
5 × 5	15/x 71/5	1.40	1269	1396	1523	1650	1777	1904	2030	2284	2538
2x10	1 × 91	1.36	2037	2241	2444	2648	2852	3056	3259	3667	4074
2x12	15/x111/6	1.34	2985	3284	3582	3881	4179	4478	4776	5373	5970
9x14	15 x 1310	1 32	4113	4524	4936	5347	5758	0219	6581	7403	8226
9x16	15/v151/	- 3	5423	5965	6507	7050	7592	8135	8677	9761	10846
2x18	15 xx 1712	1 30	6912	7603	8294	9868	2296	10368	11059	12442	13824
3x 6	21/5x 51/6	1.43	1050	1155	1260	1365	1470	1575	1680	1890	2100
3x S	21/5x 71/5	1.37	1952	2147	2342	2538	2733	2928	3123	3514	3904
3×10	21/5x 91,0	1 33	3134	3447	3761	4074	4388	4701	5014	5641	6268
3x12	21/5x111/2	1 31	4592	5051	5510	5970	6429	6888	7347	8266	9184
3x14	21/x1312	1 29	6328	6961	7594	8226	8859	9492	10125	11390	12656
2v16	91 cv 151 .	1 28	8342	9176	10010	10845	11679	12513	13347	15016	16684
3x18	212x17)2	1 27	10633	11696	12760	13823	14886	15950	17013	19139	21266
			00%	040	ř.	2011	100	000	720	1079	1100
4x 4	3/2x 3/2	1.48	020	0000	OT/	1011	4000	10000	2004	0/01	2010
4x 6	3½x 5½	1 36	1470	1917	1764	1161	2008	0022	2007	2040	0567
4x S	3½x 7½	1 30	27.34	3007	3281	5004	2828	4101	45/4	4921	50408
4x10	31/0x 91/5	1.27	4388	4827	5265	5704	6143	7869	1207	7898	9//8
4x12	316x111,0	1.25	6429	7072	7715	8358	9001	9644	10286	11572	12858
dvld	31.x131	1 23	5859	9745	10631	11517	12403	13289	14174	15946	17718
4x16	31 ox 151 a	1 22	11679	12847	14015	15183	16351	17519	18686	21022	23358
410	01,111	1 01	14000	10977	17005	10254	90042	99339	92891	96708	90776

TABLE 24-Continued.

	ncared	2000	4622 8594 13788 20206	27844 36706 46788 58094	11718 18802 27552 37968 50052 63802 79218	23816 34900 48094 63400 80816 100344	42246 58218 76746 97830 121468
	. In., as malcated	1800	4160 7735 12409 18185	25060 33035 42109 52285	10546 16922 24797 34171 45047 57422 71296	21434 31410 43285 57060 72734 90310	38021 52396 69071 88047 109321
	Founds per 5q.	1600	3698 6875 11030 16165	22275 29365 37430 46475	9374 15042 22042 30374 40042 51042 63374	19053 27920 38475 50720 64653 80275	33797 46574 61397 78264 97174
	resses in Fo	1500	3467 6446 10341 15155	20883 27530 35091 43571	8789 14102 20664 28476 37539 47852 59414	17862 26175 36071 47550 60612 75258	31685 43664 57560 73373 91101
	AN CARLOLLY WOLLDUM IN 1001 TOURS TOT FALL FIDER ATTERSOR IN	1400	3235 6016 9652 14144	19491 25694 32752 40666	8203 13161 19286 26578 35036 44661 55453	16671 24430 33666 44380 56571 70241	29572 40753 53722 68481 85028
	ounds for	1300	3004 5586 8962 13134	18099 23859 30412 37761	7617 12221 17909 24679 32534 41471 51492	15480 22685 31261 41210 52530 65224	27460 37842 49885 63590 78954
F 3	1 1001 III 8	1200	2773° 5156 8273 12123	16706 22023 28073 34856	7031 11281 16531 22781 30031 38281 47531	14289 20940 28856 38040 48490 60206	25348 34931 46048 58698 72881
	ing Monen	1100	2542 4727 7583 11113	15314 20188 25733 31952	6445 10341 15154 20882 27529 35091 43570	13099 19195 26452 34870 44449 55189	23235 32020 42210 53807 66807
2	healst	1000	2311 4297 6894 10103	13922 18353 23394 29047	5859 9401 13776 18984 25026 31901 39609	11908 17450 24047 31700 40408 50172	21123 29109 38373 48915 60734
	Multiplying Factor		1.30	71.116	28887425	11123	111111111111111111111111111111111111111
Size	Surfaced	or S4S	51/2x 51/2 51/2x 71/2 51/2x 91/2 51/2x 111/2	512x1312 512x1532 512x1732 512x1912	7½x 7½ 7½x 9½ 7½x11½ 7½x13½ 7½x13½ 7½x15½ 7½x17½	915x 915 915x1115 912x1312 912x1512 912x1712 912x1912	11,2x1112 11,5x1312 11,5x15,2 11,5x17,2 111,3x19,2
S	Rough	In.	6x 6 6x 8 6x10 6x12	6x14 6x16 6x18 6x20	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	10x10 10x12 10x14 10x16 10x16 10x18	12x12 12x14 12x16 12x16 12x18 12x20

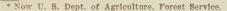
(Table 24 Concluded on Next Page.)

TABLE 24—Continued.

licated		0000		68344	114844	142594	103440	131858	163718	199026	237776	148872	184844	224706	268456	\$4001¢	205968	250386	299136	352218	409636	411900
In. as inc		1800		61510	103360	128335	93096	118672	147346	179123	213998	133985	166360	202235	241610	104400	185371	225347	269222	316996	368672	147474
nds ner Sq		1600		54675	91875	114075	82752	105486	130974	159221	190221	119098	147875	179765	214765	2020/10	164774	200309	239309	281774	327709	977103
Eher Stresses in Pounds ner So. In as indicated		1500		51258	86133	106946	77580	98894	122789	149270	178332	111654	138633	168530	201342	25/0/1	154476	187790	224352	264164	307227	040000
fe Fiher Str		1400		47841	80391	99816	72408	92301	114603	139318	166443	104214)	129391	157294	187919	221200	144178	175270	209395	246553	286745	078870
ofte Sofe		1300		14424	74649	92686	67236	85708	106417	129367	154554	79296	120149	146059	174496	200401	133879	162751	194438	228942	266263	500401
Pasisting Moments in Foot Pounds for		1900	0007	41006	90689	85556	62064	79115	98231	119415	142665	89323	110906	134823	161073	189696	123581	150231	179481	211331	245781	282851
Moments	c	1100	0017	37589	63164	78427	56892	72522	90045	109464	130777	81880	101664	123588	147651	173892	113282	137712	164525	193720	225300	292862
0.00		10001	2007	34172	57492	71297	51720	65029	81859	99513	114888	74436	92422	112353	13422×	158047	102984	125193	149568	176109	204818	235693
	Multiplying Factor			1.12	1 10	1.09	1.10	1 09	1 09	1 08	1 08	1 09	1 08	1 08	1 07	1 07	1.08	1.07	1.07	1,07	1 06	90 -
Size	Surfaced	or S4S	In.	131 x 131 2			151 x1516	15 x171,	151 X1932	151 x211,	151 2x2312				171 2x2312		191 x 191 s	191 x211 2	191 2x2312	191 2x25 1/2	1912x271/2	19/2x29/2
75	Rough		In.	14x14	14×10	14x20	16×16	16x1x	16x20	16x22	16x24	18×18	18x20	18x22	18x24	18x26	20x20	20x22	20x24	20x26	20x2x	20x30

SAFE LOADS ON COLUMNS

In computing safe loads on columns two standard formulae have been used, one a straight line formula adopted by the American Railway Engineering Association, and the other a curved line formula established by the U.S. Department of Agriculture, Division of Forestry*. In both formulae safe fiber stresses in end compression have been used varying from 1,000 to 1,600 pounds per square inch.



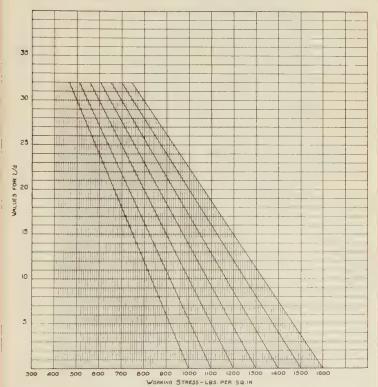


Diagram 14. Graphic presentation of column formula adopted by the American Railway Engineering Association for safe fiber stresses of 1,000 to 1,600 pounds per square inch. See table 25 for explanation of formula.

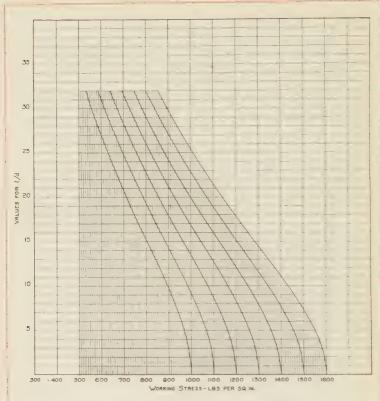


Diagram 15. Graphic presentation of column formula established by U. S. Dept. of Agriculture, Forestry Division (now U. S. Dept. of Agriculture, Forest Service), for safe fiber stresses of 1,000 to 1,600 pounds per square inch. See table 26 for explanation of formula.

FORMULA ADOPTED BY THE AMERICAN RAILWAY ENGINEERING ASSOCIATION

Working unit stress = C (1-l/60d) in pounds per square inch.

C = Safe fiber stress in end compression, in pounds per square inch.

1 = Length of column, in inches.

d = Least diameter or dimension of column, in inches.

FORMULA ESTABLISHED BY THE U. S. DEPT. OF AGRICUL-TURE, FORESTRY DIVISION*

Working Unit Stress =
$$C = \frac{(700+15c)}{(700+15c+c^2)}$$

C = Safe fiber stress in end compression, in pounds per square inch.

l = Length of column, in inches.

d = Least diameter or dimension of column, in inches.

c = l/d.

Diagrams 14 and 15 have been prepared and may be used for determining the working unit stresses for columns. The working unit stresses given in tables 25 and 26 have been taken directly from the diagrams and show in tabular form the corresponding safe fiber stresses for values of l/d varying from 15 to 32.

In the preparation of tables 27 and 28, the diagrams have been used only for computing the total safe loads on columns in which the ratio of length to smallest dimension is 15 or greater. In figuring the safe loads on columns in which l/d is less than 15 the working unit stresses in end compression shown at the top of tables have been used.

The tables show safe bearing loads for columns 6"x6" to 26"x26" in cross section, surfaced S1S1E or S4S. The area of the actual cross section is shown in square inches, together with the length of the column and the ratio l/d. Multiplying factors are also shown in bold face in these tables, and may be used in converting the various values shown, to similar values, for full size (rough) columns. The figures in the column headed "Multiplying Factor" apply to the loads shown in the same horizontal line. For example, the table based on the U. S. Department of Agriculture formula shows that by using a working unit stress of 1,600 pounds per square inch a 14"x14" column 18 feet long, surfaced to $13\frac{1}{2}$ "x $13\frac{1}{2}$ ", will support a load of 228,910 pounds. This same column in the rough size would support a load equal to 228,910x1.09 or 249,510 pounds.

^{*} Now the U. S. Dept. of Agriculture, Forest Service.

WORKING UNIT STRESSES IN POUNDS PER SQUARE INCH FOR SQUARE END DOUGLAS FIR COLUMNS, SYMMETRICALLY LOADED

Based on the formula adopted by the American Railway Engineering Association.

Working Unit Stress = C (1-l/60d).

C == Safe fiber stress in end compression, in pounds per square inch.

l = length of column, in inches.

d = least side or diameter, in inches.

When 1/d is less than 15, use "C."

l/d	1000	1100	1200	1300	1400	1500	1600
5	749	824	900	974	1049	1125	1200
6	732	806	879	952	1025	1100	1182
7	716	787	860	930	1002	1075	1145
8	700	769	840	909	979	1050	1119
9	683	750	819	887	955	1025	1092
0	666	732	800	866	932	1000	1065
1	649	714	779	843	909	975	1039
2	632	696	760	822	885	950	1012
3	616	677	739	801	862	925	985
4	600	659	720	779	839	900	959
5	582	640	699	757	815	875	932
6	566	622	680	735	792	850	906
7	549	604	659	714	769	S25	879
8	533	585	639	692	746	800	852
9	516	567	620	670	722	775	825
0	500	548	599	649	699	750	799
1	483	530	580	627	675	725	772
2	466	512	559	606	651	700	74

WORKING UNIT STRESSES IN POUNDS PER SQUARE INCH FOR SQUARE END DOUGLAS FIR COLUMNS, SYMMETRICALLY LOADED

Based on formula established by the U. S. Dept. of Agriculture Forestry Division*

Working Unit Stress =
$$C \frac{(700+15c)}{(700+15c+c^2)}$$
 $c = l/d$.

C == Safe fiber stress in end compression, in pounds per square inch.

l =length of column, in inches.

d == least side or diameter, in inches.

When I/d is less than 15, use "C."

1	Worki	ng Unit Stres	ses in Pound	ls per Sq. In	. for Values	of "C" as i	indicated
7/d	1000	1100	1200	1300	1400	1500	1600
5	804	884	965	1046	1127	1206	1284
6	785	864	943	1022	1100	1179	1255
7	767	844	921	998	1075	1150	1226
8	749	823	899	974	1050	1124	1199
9	730	805	878	950	1025	1097	1170
0	712	786	857	928	1000	1071	1143
1	695	768	837	905	975	1046	1117
2	679	750	817	883	951	1020	1090
3	663	731	796	861	929	996	1063
4	647	714	778	841	906	971	1039
5	631	697	759	821	884	949	1013
6	617	681	741	802	864	927	989
7	601	664	724	784	844	905	965
8	587	648	707	766	824	883	942
29	573	632	690	748	805	862	920
0	559	617	674	730	787	841	899
1	547	601	659	713	768	821	878
2	534	587	643	696	750	801	856

^{*} Now U. S. Dept. of Agriculture, Forest Service.

TABLE OF SAFE BEARING LOADS IN 1,000 POUND UNITS FOR SQUARE END DOUGLAS FIR COL-UMNS, SYMMETRICALLY LOADED

Based on the formula adopted by the American Railway Engineering Association

Working Unit Stress = C (1-b/60d.)C = Safe fiber stress in end compression, in pounds per square

l = length of column, in inches. d = lenst side or diameter, in inches. When l/d is less than 15, use "C." Values in this table are based on surfaced sizes. To get values for rough sizes, multiply bearing load by multiplying factor in bold face in same horizontal line. To get cross-section of rough size, multiply area given by factor in bold face directly below.

Safe Bearing Loads in 1000 Pound Units for Values of "C" as indicated		1500 1600			38 48.	38 48. 09 34.	38 48. 09 34. 82 30.	38 48. 09 34. 82 30. 50 27.	45.38 48.40 33.09 34.22 35.09 30.74 25.50 27.20 23.76	38 48 09 34 82 30 28 27 28 23	38 48. 99. 99. 99. 99. 99. 99. 99. 9	38. 48. 48. 99. 27. 28. 23. 90. 777 655.	288 488 488 299 233 23 23 23 23 23 23 23 23 23 23 23 23	288 488 488 488 282 288 283 284 882 283 284 882 283 284 882 283 284 884 884 884 884 884 884 884 884 884	288 248 488 25 27 27 28 28 28 28 28 28 28 28 28 28 28 28 28	28.82 28.23 28.23 28.23 28.23 28.83 28.83 29.65 20.65	28. 28. 38. 48. 29. 29. 29. 29. 29. 29. 29. 29. 29. 29	28.82 28.82 28.82 28.82 29.84 48.82 29.83 20	23.88.9 44.88.89 34.89.99 34.89.99 35.99 36.99.99 37.77 38.89.99 38.89.99 48.89.99 48.89.99 49.99 49.99	882 882 890 894 895 895 895 895 895 895 895 895 895 895	88.8.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.	88.2 23.8 8.9 8.0 2.3 3.4 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0	88.8.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.9.	288 288 488 699 699 699 699 699 699 699 699 699 6	388 4 4 4 4 4 4 101 101 101 101 101 101 101	888 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
Values of "C		1400	-						29 35 26 89 23 80 20 79									25.088 20.087 20	889 889 887 887 887 887 887 887 887 887	889 889 780 1780 1833 87 87 87 87 87	888 888 889 887 887 887 887 887 887 887	25.0.28.28.28.29.29.44.28.28.28.28.29.29.29.29.29.29.29.29.29.29.29.29.29.	25.55.88.89.95.55.25.25.25.25.25.25.25.25.25.25.25.25	25.5.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.	8889 8899 779 887 887 887 887 887 887 88	25.52.88.89.55.75.88.89.55.89.89.89.89.89.89.89.89.89.89.89.89.89.
md Units for		1300							29.33 27.81 24.97 22.10 19.31																	
in 1000 Pou		1200	,						26.30 23.05 20.40 17.82																	
aring Loads)	1100							23 53 21 13 18 70 16 34	23 53 23 18 70 16 34																
Safe Bes		1000								21 39 19.21 17.00 14.85																
	Medei	plying Factor		1 19	5	1 23	1 23	1.25	23.1.1.27	1.25	1.23	22.23.23.24.44.44.44.44.44.44.44.44.44.44.44.44.	123	28272727474	23 1 29 1 29 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.25 1.27 1.29 1.14 1.19	23.7.2.7.2.7.2.7.1.1.1.1.1.1.1.1.1.1.1.1.1	127 127 128 129 129 129 129 129 129 129 129 129 129	1 20	22,23,3,2,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	222233 242233 252333 252333 252333 252333	2525233 2525233 2525233 2525233 2525233 2525233 2525233 2525233 25252 25252 2	25.52.23 25.	222233 2441111 20111111111111111111111111111111	282228 4922818 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	1/1	p /								217.5																
	Length	Column	1. 1.	9		1.	20	V 0 0	v 0 2 4	v554	v524 x	v524 ∞5	v0554 ×05	V054 %05	VOSTA 80514	VOST 805141	VOU4 800448	.5074	v004 x00448 x	v 5 5 4 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	v554 x55458 x55	v5074	v557 x557458 x5374	v554 %55458 %5446	v5574 x557458 x557468	v5574 x557458 x657458
	Treat	Section	Sq. In.			20 25	30.25	30.25	30.25	30.25	30.25	38 25	38 25	30 25 1 19 1 19 56.25	56.25 1 19 1.14	20.25 1 19 1.14 1.14	30.25 1 19 1 19 1 14	30.25 1 19 10.25 1 144	05.25 1 36.25 1.14 1.14	36.23 1 36.23 1.14	60 60 60 60 60 60 60 60 60 60 60 60 60 6	36.25 1 36.25 1 1.14 2.25 2.25 2.25 2.25 2.25 2.25 2.25 2.2	30 1 25 1 19 1 19 1 1 19 1 1 19	65 1 65 1 69 1 69 1 69 1 69 1 69 1 69 1	30.25 1.14 90.25 1.11 1.11	30 25 1 19 1 14 1 14 1 111
2/20		Surfaced S1S1E or S4S	In.	0			512A 5/2	3	×.	3	The state of the s	*	10 To 10	\$ 5	51 2 4 2) 2 2 17 4 71 2	51.5 5.7 5.7 5.7 5.7 5.7 5.7 5.7 5.7 5.7 5	5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	5 th 5/2 7 th 7/2	51 2x 5) 2 71 x 71 2	2 (5 42 17 17 17 17 17 17 17 17 17 17 17 17 17	5 (5 45) 5 (5 47) 5 (2 (5 ×2) 2 ×2 1	51 2	2 (5 ×2) 5 × 17 × 18 × 18 × 18 × 18	5 (2 × 5) 2 7 (2 × 7) 2 9 (3 × 9) 2	5 (2, 43, 5) 2 2 (3, 43, 5) 2 9 (4, 49, 5)
		Rough	In.			25 55	6 x 6	9 ×9	6 v 6	9 49	6 v 6	9 29	9 19	8	8 × ×	5 × × × ×	S X	2 × ×	\$ X	2 × × × × × × × × × × × × × × × × × × ×	6 × 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	6x 6 5x 8 10x10	6x 6 8x 8 10x10	6x 6 5x 8 10x10	6 × 6 × 8 × 8 × 8	6 x 6 5 x 8 x 8 x 8 x 8 x 8 x 8 x 8 x 8 x 8 x

PACIFIC COAST WOODS

211.60 211.60 152.56 145.15 137.74 130.35 123.15	291.60 291.60 213.46 204.99 196.24 187.79	384.40 384.40 284.46 275 23 264.85	490.00 490.00 366.53 354.77	608.40	739 60 739 60	883.60 883.60	1040.40
198.38 198.38 143.03 136.08 129.14 122.21 115.46	273.38 273.38 200.12 192.18 183.97 176.06	360.38 360.38 266.69 258.03 248.30	459.38 459.38 343.62 332.60	570.38	693 38 693 38	828.38 828.38	975.38
185 15 185 15 133 49 120 53 114 06 107 76	255.15 255.15 186.77 179.37 171.71	336.35 336.35 248.91 240.83 231.74	428.75 428.75 320.71 310.42	532.35	647.15	773.15	910.35
171.93 171.93 123.96 117.94 111.92 105.91	236.93 236.93 173 43 166.56 159.45	312.33 312.33 231.13 223.63 215.19	398.13 398.13 297.80 288.25	494.33	600 93 600 93	717.93	845.33 845.33
158 70 158 70 114 42 108 86 103 31 97.76 92 36	218.70 218.70 160.09 153.74 147.18	288.30 288.30 213.35 206.42 198.64	367.50 367.50 274.90 266.08	456.30	554 70 554.70	662.70 662.70	780.30
145 48 145 48 104 89 99 79 94 70 89 62	200 48 200 48 146 75 140 93 134 92 129 11	264.28 264.28 195.57 189.22 182.08	336.88 336.88 251.99 243.90	418.28	508.48 508.48	607.48	715.28
132 25 132 25 95 35 90 72 86 09 81 47 76.97	182.25 182.25 133.41 128.12 122.65 117.37	240.25 240.25 177.79 172.02 165.53	306.25 306.25 229.08 221.73	380_25 380_25	462.25 462.25	552.25	650.25 650.25
111108	000000000000000000000000000000000000000	1.07	1.06	1.05	1.05	1.04	1.04
25.0 25.0 25.0 25.0 25.0 25.0	7.1 14.2 16.0 17.8 19.6	7.7 14.0 15.5 17.0 18.6	6.9 13.7 15.1 16.5	6.2	5.6	5.1	11.3
22 22 22 24 25 25 25 27	8 to 16 20 22 24	10 to 22 22 24 24 24 24 24 24 24 24 24 24 24	10 to 22 22 24	10 to 24	10 to 24	10 to 24	10 to 24
1.09	182.25	240 25	306.25	380 25	462.25	552.25	650.25
H ₂ xH ₂	13 ¹ 2x13 ¹ 2	15 ¹ ₂ x15 ¹ ₂	1712/17/2	19j 2x19j 2	2112x2112	231 ₂ x231 ₂	251 2X25, 2
12x12	14x14	16x16	18315	20x20	22x22	24x24	26x26

TABLE OF SAFE BEARING LOADS IN 1,000 POUND UNITS FOR SQUARE END DOUGLAS FIR COL-UMNS, SYMMETRICALLY LOADED

Based on the formula established by the U.S. Dept. of Agriculture-Forestry Division.*

== 1/d. $(700 + 15c + c^2)$ (700+15c) Working Unit Stress

d == least side or diameter, in inches. When 1/d is less than 15, use "C." l == length of column, in inches.

Values in this tuble are based on surfaced sizes. To get values for rough sizes, multiply bearing load by multiplying factor in bold face in same horizontal line. To get cross-section of rough size, multiply area given by factor in bold face directly below. C == Safe fiber stress in end compression, in pounds per square incb.

s indicated	1600		48.40	36.	33.	. 29.	26.	0	90	70.	65.	.09	55.98	51.	144	3 144.40	115.	108.	102.	.96	- 90
ss of "C" as	1500		45.38	34.	30.	27.	25.	-	- X	. 99	- 61.	56.	52.49	48.	135	135,38	108.	101	95.	- 30	84
s for Value	1400	,	42.35										48.99			126.35					
Pound Unit	1300		39.33										45.49			117.33					
Safe Bearing Loads in 1000 Pound Units for Values of "C" as indicated	1900		36.30											38.88		108.30					
Bearing Loa	1100	000			22.69									35.64		99.28					
Safe	1000	Y			20.63									32.40		90.25					
Multi	plying Factor		1.19	1.23	1.24	1.25	1.26		1.14	1.17	1.17	1.18	1.18	1.19	11	-	1.13	1,13	1.14	1.14	1 14
	p/2						30.5							28.8		12.6					
Length	Column	Ft.	9			_	14		00	10	12	14	16	100	Of	10	12	14	16	00	20
Area	Section	Sq. In.		30.25	1.19					56.25	1 14						90.25	111			
Size	SISIE or SAS	In.		51 X 51,						11. 11.							91 ox 91 o	7/2 -7/2			
1	Rough	In.	1	fix 6						S XX							10110				

211.60 211.60 163.36 155.31 147.49 140.29	291.60 291.60 228.91 218.99 209.95 201.20	384.40 384.40 305.60 294.83 283.30	490.00 490.00 393.47 379.74	608 40 608.40	739.60	883.60 883.60	1040.40
198.38 198.38 153.15 145.61 138.27 131.52	273.38 273.38 214.61 205.31 196.83	360.38 360.38 286.50 276.41 265.59	459.38 459.38 368.88 356.01	570.38	693.38	828.38 828.38	975.38
185.15 185.15 142.94 135.90 129.05 122.75 116.83	255.15 255.15 200.38 191.62 183.71 176.05	336.35 336.35 267.40 257.98 247.88	428.75 428.75 344.29 332.28	532.35	647.15 647.15	773.15	910.35
171.93 171.93 132.73 126.19 119.88 113.98	236.93 236.93 185.99 177.93 170.59	312.33 312.33 248.30 239.55 230.18	398.13 398.13 319.70 308.54	494.33	600.93	717.93	845.33
158.70 158.70 122.52 116.48 110.62 105.22	218.70 218.70 171.68 164.24 157.46	288.30 288.30 229.20 221.12 212.47	367.50 367.50 295.10 284.81	456.30 456.30	554.70	662.70 662.70	780.30
145 48 145 48 112.31 106.78 101.40 96.45 91.80	200.48 200.48 157.38 150.56 144.34 138.33	264.28 264.28 210.10 202.70 194.77	336.88 336.88 270.51 261.07	418.28	508.48	607.48	715.28
132_25 132_25 102_10 97_07 92_18 87_68 83_45	182.25 182.25 143.07 136.87 131.22	240.25 240.25 191.00 184.27 177.06	306.25 306.25 245.92 237.34	380.25	462.25	552.25	650.25 650.25
12211138	1.088	1.07 1.08 1.08 1.08	1.06	1.05	1.05	1.04	1.04
23.0 23.0 25.0	7.1 14.2 16.0 17.8 19.6	7.7 14.0 15.5 17.0	6.9 13.7 15.1 16.5	6.2	5.6	5.1	11.3
8 to 14 8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	8 to	10 to 18 20 22 22 24	10 to 20 22 24	10 to 24	10 to 24	10 to 24	10 to 24
132 25	182.25	1.07	306.25	380.25	462.25	552.25	650.25
11,5x11,5	13) 2x13 ^{1,2}	15, 2x15½	17,2x17,2	19 ¹ / ₂ x19 ¹ / ₂	21, 2x21, 2	23,5x231/2	25½x25½
12x12	14x14	16x16	18x18	20x20	22x22	24x24	26x26

*Now U. S. Department of Agriculture, Forest Service.

JOIST CONSTRUCTION

Table 29 shows the lineal feet of joists per square foot of floor space required for joists spaced 12" to 24" on centers. This table also gives the number of board feet of joists and the weight in pounds per square foot of floor space for the various spacings of joists.

JOIST CONSTRUCTION

Lineal feet, board feet and weight per square foot of floor surface for various sizes and spacings of Douglas fir joists.

TABLE 29

1	Size			Per Squar	re Foot of F	loor Surface	
Rough	Surfaced S1S1E or S4S	Distance on Centers		Num	ber of		Weight (Air-dry material at 34 lbs. per cu. ft.)
In.	In.	In.	Linea	l Feet	Board	Feet	Lbs.
2x 4 2x 4 2x 4	15/8x 35/8 15/8x 35/8 15/8x 35/8	12 16 20	3/4 3/5	1.00 .75 .60	2/3 1/2 2/5	.67 .50 .40	1.391 1.043 .8346
2x 6 2x 6 2x 6	15/8x 55/8 15/8x 55/8 15/8x 55/8	12 16 20	1 3/4 3/5	1.00 .75 .60	1 3/4 3/5	1.00 .75 .60	2.159 1.619 1.295
2x 8 2x 8 2x 8 2x 8	15/8x 71/2 15/8x 71/2 15/8x 71/2 15/8x 71/2	12 16 20 24	1 3/4 3/5 1/2	1.00 .75 .60 .50	1-1/3 1 4/5 2/3	1.33 1.00 .80 .67	2.879 2.159 1.727 1.440
2x10 $2x10$ $2x10$ $2x10$ $2x10$ $2x10$	15/8x 91/2 15/8x 91/2 15/8x 91/2 15/8x 91/2 15/8x 91/2	12 16 18 20 24	1 3/4 2/3 3/5 1/2	1.00 .75 .667 .60	1-2/3 1-1/4 1-1/9 1 5/6	1.67 1.25 1.11 1.00 .83	3.644 2.733 2.441 2.186 1.822
2x12 2x12	15/8x111/2 15/8x111/2	12 16	1 3/4	1.00	2 1-1/2	2.00 1.50	4.412 3.309
2x14 2x14 2x14	$\begin{array}{c} 15/8 \times 13\frac{1}{2} \\ 15/8 \times 13\frac{1}{2} \\ 15/8 \times 13\frac{1}{2} \end{array}$	12 14 16	1 6/7 3/4	1.00 .857 .75	2-1/3 2 1-3/4	2.33 2.00 1.75	5,180 4,439 3,885
2x16 2x16 2x16	15/8x151/2 15/8x151/2 15/8x151/2	12 14 16	1 6/7 3/4	1.00 .857 .75	2-2/3 2-2/7 2	2.67 2.29 2.00	5.947 5.097 4.460
3x12 3x12	2½x11½ 2½x11½	12 16	3/4	1.00	3 2-1/4	3.00 2.25	6.788 5.091
3x14 3x14 3x14	$\begin{array}{c} 2\frac{1}{2}x13\frac{1}{2} \\ 2\frac{1}{2}x13\frac{1}{2} \\ 2\frac{1}{2}x13\frac{1}{2} \end{array}$	12 14 16	1 6/7 3/4	1.00 .857 .75	3-1/2 3 2-5/8	3.50 3.00 2.63	7.967 6.828 5.975
3x16 3x16 3x16	$\begin{array}{c} 2\frac{1}{2}x15\frac{1}{2} \\ 2\frac{1}{2}x15\frac{1}{2} \\ 2\frac{1}{2}x15\frac{1}{2} \end{array}$	12 14 16	1 6/7 3/4	1.00 .857 .75	4 3-3/7 3	4.00 3.43 3.00	9.144 7.836 6.858
4x16 4x16 4x16	$\begin{array}{c c} 3\frac{1}{2}x15\frac{1}{2} \\ 3\frac{1}{2}x15\frac{1}{2} \\ 3\frac{1}{2}x15\frac{1}{2} \end{array}$	12 14 16	6/7 3/4	1.00 .857 .75	5-1/3 4-4/7 4	5.33 4.57 4.00	12.80 10.97 9.600

BOARD MEASURE AND WEIGHT PER LINEAL FOOT FOR VARIOUS SIZES

Table 30 shows the board feet per lineal foot for various sizes based on dimensions of rough timbers. This table also shows the weight per lineal foot for rough and surfaced lumber, both green and air-seasoned.

BOARD MEASURE AND WEIGHT PER LINEAL FOOT FOR DOUGLAS FIR

Green weight based on 32 per cent moisture—38 pounds per cubic foot.

Air-seasoned weight based on 18 per cent moisture—34 pounds per cubic foot.

Oven-dry weight—29 pounds per cubic foot.

TABLE 30

Si	ze !			Weight per	Lineal Foot	
	Surfaced =	Per Lineal Fcot	Re	ough	Surfaced S	1S1E or S4S
Rough	SISIE or S4S	,	Green	Air Seasoned	Green	Air Seasoned
In.	In.	Board Feet	Lbs.	Lbs.	Lbs.	Lbs.
2x 4 2x 6 2x 8 2x10 2x12 2x14 2x16 2x18 2x20	15/8x 35/8 15/8x 55/8 15/8x 71/2 15/8x 91/2 15/8x 111/2 15/8x 131/2 15/8x 131/2 15/8x 131/2 15/8x 131/2	2/3 1 11/3 12/3 2 21/3 22/3 3 31/4	2.111 3.168 4.220 5.280 6.335 7.390 8.440 9.500 10.540	1.890 2.832 3.777 4.723 5.665 6.612 7.553 8.500 9.443	1.554 2.411 3.216 4.073 4.931 5.788 6.648 7.505 8.360	1.391 2.159 2.879 3.644 4.412 5.180 5.947 6.718 7.480
3x 6 3x 8 3x10 3x12 3x14 3x16 3x18 3x20	2½x 5½ 2½x 7½ 2½x 9½ 2½x11½ 2½x11½ 2½x15½ 2½x15½ 2½x15½ 2½x17½	$1\frac{1}{2}$ $2\frac{1}{2}$ $2\frac{1}{2}$ $3\frac{3}{4}$ $4\frac{1}{2}$ 5	4.750 6.335 7.918 9.500 11.080 12.660 14.250 15.820	4.250 5.665 7.085 8.500 9.915 11.320 12.750 14.160	3.630 4.947 6.270 7.590 8.909 10.220 11.540 12.860	3 .248 4 .427 5 .608 6 .788 7 .967 9 .144 10 .330 11 .510
4x 4 4x 6 4x 8 4x10 4x12 4x14 4x16 4x18	3½x 3½ 3½x 5½ 3½x 7½ 3½x 9½ 3½x11½ 3½x13½ 3½x15½ 3½x15½ 3½x15½	11/3 2 22/4 31/3 4 4 42/3 51/3 6 6 62/3	4.220 6.335 8.440 10.540 12.660 14.790 16.890 19.000 21.120	3.777 5.665 7.553 9.450 11.320 13.220 15.110 17.000 18.900	3.231 5.080 6.928 8.775 10.620 12.460 14.310 16.160 18.010	2.890 4.545 6.200 7.850 9.507 11.160 12.800 14.460 16.110

(Table 30 Concluded on Next Page.)

TABLE 30—Continued.

S	Size			Weight per I	Ineal Foot	
	Surfaced	Per Lineal Foot	R	ough '	Surfaced S	SISIE or S4S
Rough	S1S1E or S4S		Green	Air Seasoned	Green	Air Seasoned
In.	In.	Board Feet	Lbs.	Lbs.	Lbs.	Lbs.
6x 6 6x 8 6x10 6x12 6x14 6x16 6x18 6x20	5½x 5½ 5½x 7½ 5½x 9½ 5½x 9½ 5½x11½ 5½x15½ 5½x15½ 5½x17½ 5½x19½	3 4 5 6 7 8 9	9.50 12.66 15.82 19.00 22.16 25.34 28.50 31.67	8.50 11.32 14.16 17.00 19.82 22.67 25.50 28.32	7.98 10.88 13.79 16.69 19.60 22.50 25.40 28.30	7.142 9.74 12.34 14.93 17.54 20.12 22.72 25.32
8x 8 8x10 8x12 8x14 8x16 8x18 8x20	7½x 7½ 7½x 9½ 7½x11½ 7½x13½ 7½x13½ 7½x15½ 7½x17½ 7½x19½	5½3 6½3 8 9½3 10½3 12 13½	16.89 21.12 25.34 29.56 33.79 38.00 42.20	15.11 18.90 22.67 26.44 30.22 34.00 37.77	14.85 18.80 22.75 26.72 30.68 34.63 38.58	13.28 16.82 20.36 23.91 27.44 31.00 34.50
10x10 10x12 10x14 10x16 10x18 10x20	9½x 9½ 9½x11½ 9½x13½ 9½x15½ 9½x15½ 9½x17½ 9½x19½	8½ 10 11½ 13½ 15 16½	26,40 31,67 36,99 42,20 47,50 52,80	23.60 28.32 33.02 37.77 42.50 47.22	23.81 28.83 33.85 38.88 43.89 48.90	21.31 25.80 30.29 34.79 39.27 43.75
12x12 12x14 12x16 12x18 12x20	$\begin{array}{c} 11\frac{1}{2}x11\frac{1}{2} \\ 11\frac{1}{2}x13\frac{1}{2} \\ 11\frac{1}{2}x15\frac{1}{2} \\ 11\frac{1}{2}x17\frac{1}{2} \\ 11\frac{1}{2}x19\frac{1}{2} \end{array}$	12 14 16 18 20	38.00 44.33 50.67 57.00 63.33	34.00 39.66 45.33 51.00 56.63	34.90 40.97 47.03 53.10 59.19	31.21 36.65 42.10 47.50 52.95
14x14 14x16 14x18 14x20	$\begin{array}{c} 13\frac{1}{2}x13\frac{1}{2} \\ 13\frac{1}{2}x15\frac{1}{2} \\ 13\frac{1}{2}x17\frac{1}{2} \\ 13\frac{1}{2}x19\frac{1}{2} \end{array}$	16½ 18⅔ 21 23⅓	51.76 59.13 66.50 73.87	46.30 52.90 59.50 66.10	48.10 55.20 62.33 69.45	43.03 49.40 55.78 62.17
16x16 16x18 16x20 16x22 16x24	15½x15½ 15½x17½ 15½x19½ 15½x21½ 15½x21½	21½ 24 26½ 29½ 32	67.57 76.00 84.40 92.90 101.30	60.46 68.00 75.50 83.18 90.60	63.40 71.58 79.80 87.90 96.10	56.71 64.02 71.40 78.67 86.00
18x18 18x20 18x22 18x24	$\begin{array}{c} 17\frac{1}{2}x17\frac{1}{2} \\ 17\frac{1}{2}x19\frac{1}{2} \\ 17\frac{1}{2}x21\frac{1}{2} \\ 17\frac{1}{2}x23\frac{1}{2} \end{array}$	27 30 33 36	85.50 95.00 104.50 114.00	76.50 85.00 93.50 102.00	80.80 90.05 99.26 108.55	72.30 80.60 88.82 97.10
20x20 20x22 20x24	$\begin{array}{c} 1912 x 1912 \\ 1912 x 2112 \\ 1912 x 2312 \end{array}$	3314 3624 40	105.50 116.10 126.70	94.40 103.90 113.40	100.37 110.60 120.92	89.75 99.00 108.20
22x22 22x24	$\substack{21^{1} {}_{2}x21^{1} {}_{2}' \\ 21^{1} {}_{2}x23^{1} {}_{2}'}$	401 g	127.80 139.40	114.20 124.70	122.00 133.40	109.15 119.30
24x24	231 2x231 2	48	152.00	136 00	145.75	130.45
26x26	25½x25½	561/9	178.40	159 60	171.50	153.50

TABLE OF BOARD MEASURE

	32	211/3	24 25 50 25 8 25 8	742%	106%	48 90 112 112 128 144 160	8642% 1065% 1286% 1170% 1922 2133%
	30	300	\$ 0.0 g	8288	990	45 60 75 105 120 135 150	40 60 100 120 140 180 200
-	28	18% 28 28	462%	651% 742%	931/3	24 20 20 20 20 20 20 20 20 20 20 20 20 20	2717 2717 1112 130% 14917 186% 186%
	26	171/3	4 4 3 4 5 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7	69% 69%	86%	39 65 78 91 104 117 130	25.5 60.0 10.0
	24	24	204	92.9	8.23	36 60 60 72 72 84 108 120	28.4.08.0 2.2.1.1.2.4.0.0 2.2.2.4.1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
n Feet	22	142/3	3.05 20.05 2	5113	733/3	33 55 66 77 88 99 110	291/3 582 731/3 1022/3 1171/3 1463/3
Length in Feet	20 ,	13,3	3373	462/3 531/3	662% 662%	100 100 100 100 100 100 100 100 100 100	26.5 66.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7
	100	218	30.0	828	60	72844587 7844887 786488 786488 78648 76648	48849078801 48890248601
	16	10%3	26,23	371/3 422/3	53373	428 488 488 488 727 80 80 80 80 80 80 80 80 80 80 80 80 80	2217 2227 2327 2347 2427 2427 2667 2677 2677 2677 2677 26
	14	91/3	1828	322%	42	22 28 28 28 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	282 826 826 827 827 827 827 827 827 827 827 827 827
	12	25 21	988	4 80 51	36	24 4 5 3 3 4 4 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	25 4 4 5 2 5 4 5 5 5 6 4 5 6 5 6 6 6 6 6 6 6 6 6 6
	10	62/8	13%	2337 3623 3623 3623 3623 3623 3623 3623	331/3	15 25 25 25 25 25 40 50 50 50	131 26% 28% 28% 28% 28% 28% 28% 28%
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Size in Inches		14x14 14x16 14x18 14x20	16x16 16x18 16x20 16x22 16x22	18x18 18x20 18x22 18x24	20x20 20x22 20x24	22x22 22x24	24x24	26x26

MILL BUILDINGS

In recent years marked improvements have been made in the construction of mill buildings. These improvements have been of such a nature as to reduce maintenance cost, fire risk, and insurance rates, and to insure a longer life for the structure. This discussion will be confined largely to that type of building known as the timber-brick mill building.

There are a number of significant details which should be considered in the design of every modern mill building. The addition of these details is inexpensive, and the accruing benefits far outweigh the added cost. Some of the most significant features which should receive consideration in the design of the highest class of mill building, are as follows:

- 1. All exterior windows should be fitted with wired glass in metal frames;
- 2. As many subdivisions in the building as are practicable should be provided, both horizontally and vertically.
- 3. Protect timber details where necessary with a brush application of coal-tar crossote, or other suitable preservative;
 - 4. Install an automatic sprinkler system as a fire protection;
 - 5. Use only large timber joists, girders and posts;
- 6. Use wide spacing of joists, and thick tongued and grooved or laminated floors;
- 7. Laminated floor timbers should be thoroughly kiln dried before being placed in the building to prevent dry rot;
 - 8. Provide stairway and elevator enclosures.

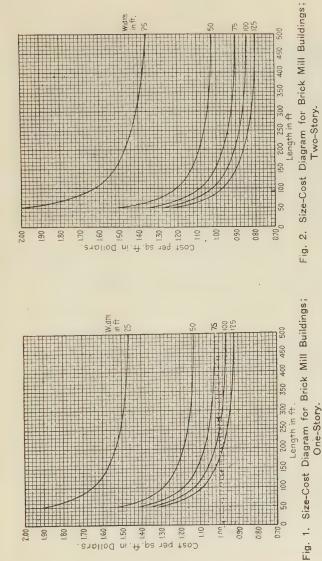
The cost, durability, and insurance rates on a building and contents are factors which concern the builder who must finance the building. He will naturally endeavor to get a building low in first cost, and also low in insurance and maintenance cost. In other words, he will or should strive to get the greatest possible returns for each dollar spent. The following discussion bears on the above factors, and presents information which is of vital interest to the builder.

DURABILITY

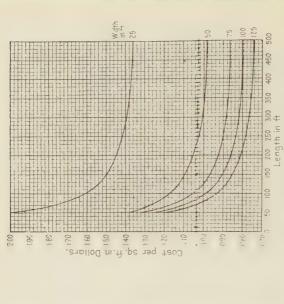
The durability of a mill building may be greatly increased by a few simple operations. The decay of wood, which is hastened by the presence of damp air and poor ventilation, starts most readily on the end grain of timbers such as girders and columns.

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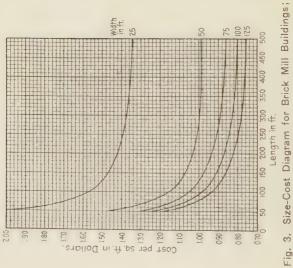
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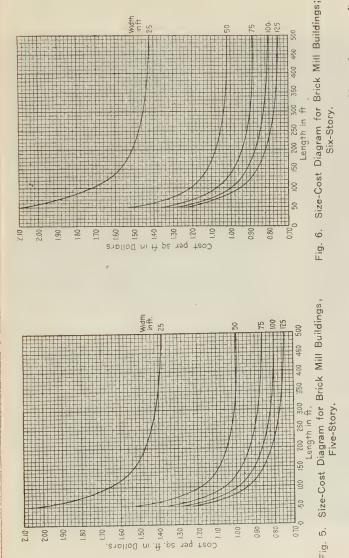
Size-cost diagrams for 1 and 2 story timber-brick mill structures. Floor loading 75 pounds per sq. ft.. Diagram 16.



Size-Cost Diagram for Brick Mill Buildings; 4. Fig. Three-Story



Floor loading 75 pounds per sq. Size-cost diagrams for 3 and 4 story timber-brick mill structures. Diagram 17.



Size-cost diagrams for 5 and 6 story timber-brick mill structures. Floor loading 75 pounds per sq. ft. Diagram 18.



Fig. 8. Some details of heavy timber construction in a mill building recently constructed in Seattle. Note application of creosote at base of column in foreground

This fact should be recognized and methods of construction so modified as to prevent conditions favorable to decay. Dry lumber should be used wherever possible and in the construction of laminated floors all lumber should be thoroughly kiln dried before being placed in the structure.

Girders or joists which rest in masonry walls should not be sealed in. An air space of at least two inches should be provided all around the end to allow proper ventilation. Two brush applications of hot coal-tar creosote or other suitable preservative will assist materially in preventing decay. Ends of girders or joists should rest on cast iron plates or joist hangers, and the bearing surface should be protected by a piece of creosote-saturated felt or asbestos.

Columns, when resting on concrete or brick piers, should have ends thoroughly painted with two coats of hot coal-tar creosote, and a piece of thin creosote-saturated board should be placed between column and pier. A metal plate between the pier and column end is also desirable. Creosote applied to the ends of columns between floors will also assist in preventing dry rot.

The above details are particularly necessary in buildings which are unheated, and are desirable in all buildings. The ends of large girders and joists should never be encased in such a way as to prevent seasoning through the end surface. Seasoning takes place more rapidly through the end grain than from any other surface, and seasoned timber is safe from dry rot just as long as it is kept dry.

The limited use of coal-tar creosote as above described should not increase fire hazard. There are, of course, other preservatives such as zinc chloride and corrosive sublimate which could not possibly increase fire dangers. These preservatives are likely to be less effective, however, than coal-tar creosote, and corrosive sublimate is a deadly poison. Fig. 8 shows some details of the heavy timbering in a mill building recently constructed in Seattle. Note the application of creosote to prevent decay at base of column in the foreground.

COST

The cost of mill buildings has been well established, and diagrams 16 to 18 will permit a quick estimate on varying sizes and heights of timber-brick mill buildings with floor loads up to 75 pounds per square foot.

These data have been taken from an article by Charles T. Main, M. Am. Soc. M. E., published in Engineering News, January 27, 1910. The diagrams are based upon the following unit values given by Mr. Main for the various materials used:

"The cost of brick walls is based on 22 bricks per cubic foot, costing \$18 per thousand, laid. Openings are estimated at 40 cents per sq. ft., including windows, doors and sills.

"Ordinary mill floors, including timbers, planking and top floor with Southern pine timber at \$40 per M ft. B. M. and spruce planking at \$30 per M, costs about 32 cents per sq. ft.. which has been used as a unit price. Ordinary mill roofs covered with tar and gravel, with lumber at the above prices, cost about 25 cents per sq. ft. and this has been used in the estimates. Add for stairways, elevator wells, plumbing, partitions and special work."

The diagrams are to be used when all conditions are normal. There are many different conditions encountered in practice which influence the cost of buildings. The following special cases are mentioned in Mr. Main's discussion, which cover various conditions and classes of buildings.

- "(a) If the soil is poor or the conditions of the site are such as to require more than the ordinary amount of foundations, the cost will be increased.
- "(b) If the end or a side of the building is formed by another building, the cost of one or the other will be reduced slightly,
- "(c) If the building is to be used for ordinary storage purposes with low stories and no top floors, the cost will be decreased from about 10% for large low buildings, to 25% for small high ones, about 20% usually being a fair allowance.
- "(d) If the buildings are to be used for manufacturing purposes and are to be substantially built of wood, the cost will be decreased from about 6% for large one-story buildings, to 35% for small high buildings; 15% would usually be a fair allowance.
- "(e) If the buildings are to be used for storage with low stories and built substantially of wood, the cost will be decreased from 13% for large one story buildings, to 50% for small high buildings; 30% would usually be a fair allowance.
- "(f) If the total floor loads are more than 75 lbs. per sq. ft. the cost is increased.

"(g) For office buildings, the cost must be increased to cover architectural features on the outside and interior finish."

Mr. Main makes the following significant deductions from the diagrams:

"(1) An examination of the diagrams shows immediately the decrease in cost as the width is increased. This is due to the fact that the cost of the walls and outside foundations, which is an important item of cost, relative to the total cost, is decreased as the width increases.

"For example, supposing a three-story building is desired with 30,000 sq. ft. on each floor:

"If the building were 600 ft. x 50 ft., its cost would be about 99 cents per sq. ft..

"If the building were 400 ft. by 75 ft., its cost would be about 87 cents per sq. ft...

"If the building were 300 ft. x 100 ft., its cost would be about 83 cents per sq. ft..

"If the building were 240 ft. x 125 ft., its cost would be about 80 cents per sq. ft...

"(2) The diagrams show that the minimum cost per square foot is reached with a four-story building. A three-story building costs a trifle more than a four-story. A one story building is the most expensive. This is due to the combination of several features: (a) The cost of ordinary foundations does not increase in proportion to the number of stories, and therefore their cost is less per square foot as the number of stories is increased, at least up to the limit of the diagram. (b) The roof is the same for a one-story building as for one of any other number of stories, and therefore its cost relative to the total cost grows less as the number of stories increases. (c) The cost of columns, including the supporting piers and castings, does not vary much per story as the stories are added. (d) As the number of stories increases, the cost of the walls, owing to increased thickness, increases in a greater ratio than the number of stories, and this item is the one which in the four story-building offsets the saving in foundations and roof.

Tables 32 and 33 show the unit values used in computing the diagrams:

DATA FOR ESTIMATING COST OF BUILDINGS

TABLE 32

Height	Foundations Including Excavations Cost per Lin. Ft.		Brick Walls Cost per Sq. Ft. of Surface		Columns including Piers and Castings	
One-Story Building Two-Story Building Three-Story Building Four-Story Building Five-Story Building Six-Story Building	For Outside Walls \$2.00 2.90 3.80 4.70 5.60 6.50	For Inside Walls \$1.75 2.25 2.80 3.40 3.90 4.50	Outside Walls \$0.40 .44 .47 .50 .53 .57	Inside Walls \$0.40 .40 .40 .43 .45 .47	Cost of One \$15.00 15.00 15.00 15.00 15.00	

DATA FOR APPROXIMATING COST OF MILL BUILDINGS OF KNOWN SIZE BUT WITHOUT DEFINITE PLANS MADE

TABLE 33

Height of Building	Foundations Including Excavation Cost per Lin. Ft.		Brick Walls Including Doors and Windows. Cost per Sq. Ft. of Surface	
	For Outside Walls	For Inside Walls	Outside Walls	Inside Walls
One Story Two Stories Three Stories Four Stories Five Stories Six Stories	\$2.00 2.90 3.80 4.70 5.60 6.50	\$1.75 2.25 2.80 3.40 3.90 4.50	\$0.40 .44 .47 .50 .53	\$0.40 .40 .40 .43 .45

Mr. Main gives the following general information which is useful in making estimates:

"From ground to first floor, 3 ft. Buildings 25 ft. wide, stories 13 ft. high. Buildings 50 ft. wide, stories 14 ft. high. Buildings 75 ft. wide, stories 15 ft. high. Buildings 100 ft. wide, stories 16 ft. high. Buildings 125 ft. wide, stories 16 ft. high.

"Floors, 32 cents per sq. ft. of gross floor space not including columns. If columns are included, 38 cents.

"Roof, 25 cents per sq. ft., not including columns. If columns are included, 30 cents. Roof to project 18 inches all around buildings.

"Stairways, including partitions, \$100 each flight. Allow two stairways, and one elevator tower for buildings up to 150 ft. long. Allow two stairways and two elevator towers for buildings up to 300 ft. long. In buildings over two stories, allow three stairways and three elevator towers for buildings over 300 ft. long.

"In buildings over two stories, plumbing \$75 for each fixture, including piping and partitions. Allow two fixtures on each floor up to 5,000 sq. ft. of floor space and add one fixture for each additional 5,000 sq. ft. of floor or fraction thereof."

INSURANCE RATES

Mill buildings of modern design are subject to low insurance rates. This fact is oftentimes lost sight of, due to confusing the good types of mill construction with poor ones. Of course, the insurance rate on poorly designed mill buildings is considerably higher than that on the fire-resisting type of construction. The following quotation is taken from an address by Chester J. Hogue, M. Am. Soc. C. E., given at a Lumbermen's Dinner in Portland, Oregon, October 15, 1915:

"Now the best comparison of safe types of fire-resisting construction can perhaps be shown by comparative insurance rates—by the judgment of men whose business it is to study this question. We have in Portland secured comparative insurance rates on a specific case, assuming a furniture store occupancy, and the rate on the wood construction building was 47 cents and on the fire proof building 35 cents, and with sprinklers, the comparison was 28 cents on the mill construction as against 21 cents on the fire proof, these rates being on the building, not the contents. The rate for the mill construction building, sprinklered, 28 cents, was less than the 35 cents on the unprinklered fire proof building.

"I also had rates from the Chicago Board of Fire Underwriters, assuming a machine shop occupancy. The rate on a building not sprinklered, of mill construction, was \$1.11 as against 24 cents for fire proof construction; and sprinklered, 15 cents for mill construction as against 14 cents for fire proof material. The

comparison there between the sprinklered mill construction building, shows 15 cents as against 24 cents for the non-sprinklered fire proof building, and where both are sprinklered, only 1 cent difference. On the contents, the rate on non-sprinklered mill construction was \$1.36 as against 64 cents for the fire proof construction; the rates on the contents sprinklered were 30 cents for the mill construction as against 26 cents for the fire proof building. The comparison there between the sprinklered mill construction was 30 cents as against 64 cents for non-sprinklered fire proof construction.

"This shows clearly that a sprinklered mill construction building is a safer risk from a fire insurance standpoint than one of non-sprinklered fire proof construction. The sprinklered mill construction building is safer both as to building and contents than a fire proof building non-sprinklered. In the same way, a mill construction building with properly constructed stairways, and elevator shafts, is safer as to contents than a non-sprinklered fire proof structure with unprotected stairways and elevator shafts.

"I believe, from my experience in both kinds of construction, that the mill construction building, with masonry walls, wire glass windows and sprinklered, would have almost as great an effect in stopping a conflagration as if the interior was of so-called fire proof construction—that is, of incombustible materials."

The modern timber-brick mill building is approximately 25% lower in first cost than a fire-resisting building, and is given almost the same advantage in insurance rates. Throughout the Pacific Coast territory where timber is inexpensive and plentiful, the difference in cost between these types of buildings will probably average above 25%.

Wood construction is safe when the proper design has been used. Its low first cost and maintenance, and its low insurance rates are strong arguments in its favor which should be carefully weighed by architects and engineers when contemplating the design of new buildings.

PILING

Douglas fir has long been considered an ideal piling material. It possesses high strength values and may be obtained in lengths varying from 10 feet to 120 feet. Due to the fact that this species grows in thick stands, it is possible to secure straight sticks almost entirely free from knots and other defects. In order to obtain reliable figures on the dimensions of Douglas fir piling, a large number of measurements have been taken on piles from two of the principal producing districts of Oregon and Washington. Approximately 50 piles of each length were taken, the lengths varying from 50 to 111 feet. Piling from the Columbia River district in Oregon, and the Puget Sound district in Washington were used in obtaining these data. Diagrams 19 and 20 show the size and natural taper of the timber. For example, if it is desired to buy piling 80 feet long and of any given butt diameter, the probable corresponding top diameter is shown on these diagrams. Of course, there is considerable variation in the individual sticks. These diagrams, however, show what actually grows and should be useful in placing practicable dimensions on Douglas fir piling when writing specifications.

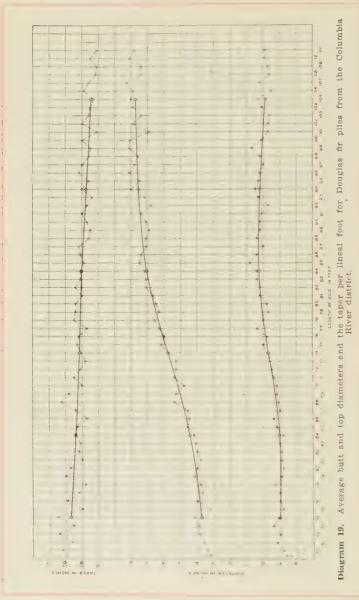
The following specification for Douglas fir piling is suggested as a guide for those writing specifications for this material.

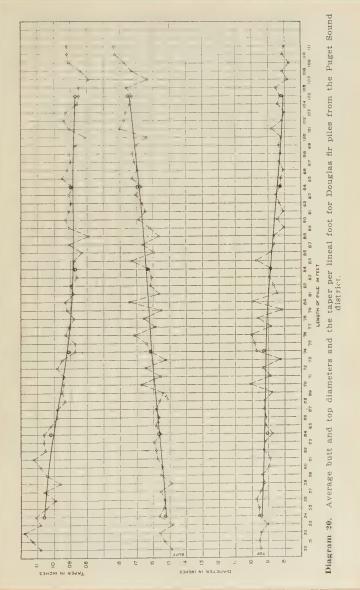
SPECIFICATION FOR DOUGLAS FIR PILING

The following specification covers two general classes of piling.

FOR CREOSOTING. Piling shall be cut from sound, live Douglas fir trees, free from felling or wind shakes, loose or unsound knots, large knots or small knots in great numbers, or other defects which in any way impair the strength or durability for the purpose intended. Each pile should have at least one-half inch of sapwood.

Piling shall be butt cut and free from swelling. Diameter three feet from butt shall not be smaller than the butt diameter by an amount greater than one inch. They shall be free from short or reverse bends. Piling shall be so straight that a line drawn from the center of the two ends shall at no point fall outside the pile. Some variations in this respect will be allowed in sticks 80 feet or more in length.





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Piling shall be free from damage by sea worms or other insects and shall be carefully peeled free from bark, and all knots shall be smoothly dressed.

FOR TEMPORARY USE. Piling shall be of Douglas fir or other species which will stand driving, free from loose or unsound knots, felling shakes, heart or wind shakes, sea worm holes, or other defects which impair its use for the purpose intended. Knots shall be trimmed close and no short or reverse bends allowed. No crooks shall be permitted exceeding one-half the diameter of pile at the middle of the bend.

CREOSOTED PILE DOCKS

During the past few years creosoted Douglas fir piling has been extensively used throughout this country for marine work. Properly creosoted Douglas fir piling withstands the attack of the marine borer for many years, and has come into very general use. Experience on the Pacific Coast has shown that a creosoted pile dock will last, on a very conservative estimate, for 18 to 20 years. In the same teredo-infested waters the life of an untreated pile dock would not exceed three to six years.

Creosoted Douglas fir piling has been found to be the most economical material for dock construction on the Pacific Coast. Large docks supporting superstructures when built on creosoted piling will cost approximately \$1.25 per square foot, while similar structures built on reinforced concrete will cost on the average approximately \$3.00 per square foot.

On the assumption that a creosoted pile dock costs \$1.25 per square foot and requires 30 per cent of the original cost to keep it in repair through a period of 25 years and that a reinforced concrete pile dock costs \$3.00 per square foot and lasts through a period of 50 years, the concrete dock will cost approximately 35 per cent more at the end of a 50-year period than the creosoted pile dock.

At the present time the commercial life of a dock of any type of construction will not exceed 30 years, due to the fact that methods of handling freight and shipping facilities are constantly changing. A dock which amply fulfills requirements today may be entirely inadequate 30 years from now. Due to this fact a

PACIFIC COAST WOODS

creosoted pile dock has the advantage of being entirely remodeled at the end of 25 to 30 years to meet the changed conditions of shipping. This is a practical point greatly in favor of a creosoted pile dock as against one of reinforced concrete, since the latter type would have to last much longer than 30 years to warrant the high initial cost of \$3.00 per square foot.

Due to the greater economy found in creosoted pile dock construction, the State Harbor Commission adopted this type of construction every place where it was practicable to drive wooden piling, in developing an elaborate system of docks in San Francisco Harbor. The "Port of Seattle Commission" also adopted creosoted pile dock construction in its extensive water front development projects for Seattle. Figures 9 to 11 show two of Seattle's dock projects during course of construction and one after completion.

THE WEST COAST LUMBERMEN'S ASSOCIATION



Driving 250,000 lineal feet of creosoted Douglas fir piling in salt Hanford Street Wharf, Port of Seattle. Fig 9.



Hanford Street Wharf, Port of Seattle, after completion. Example of slow-burning dock construction.

Smith Cove Dock, Port of Seattle, one of the largest piers in the United States. Great Northern Dock on left where S. S. Minnesota docks. Both docks built on creosoted Douglas fir piling. Fig. 11.

WOOD STAVE PIPES AND FLUMES

There is a large field for the use of creosote in connection with pipe and flume staves, used in irrigation and power development projects. Wood stave pipe has taken a prominent place in the development of irrigation districts in the West. Wood stave pipe and flumes are low in first cost and the co-efficient of friction is very small. Due to this latter fact a larger amount of water can usually be delivered through a wood pipe of a given size, all other conditions being the same, than through pipes of any other material. Wood pipe in general has the following advantages to recommend it:

- 1. It will stand high pressure.
- 2. It is light and may be readily and cheaply transported.
- 3. It has a very low co-efficient of friction.
- 4. It is simple and easy to install.
- 5. Connections may be quickly made at any point.
- 6. Wood pipe will not freeze and burst in winter.
- 7. It is not injured by slight settlements which may occur.

CAUSES OF DECAY IN WOOD PIPE

If the fibers of the wood are thoroughly saturated with water, decay is impossible. Neither can the fungus thrive if the wood is thoroughly dry. There is, however, an intermediate condition of moisture, which assists the growth of wood-destroying fungi.

Most irrigation systems are in operation but a part of each year and are therefore empty a considerable portion of the time. This condition will result in a short life for untreated wood pipe as this lack of fiber saturation is the cause of almost all decay in wood pipe. Where the pipe is under sufficient hydrostatic pressure to assure thorough saturation of the fiber, and where the pipe line is exposed to the air, untreated pipe will give good service. But, where the pressure of the water is less than a 20-foot head, or where the pipe line is only filled a portion of the time, or again, where the pipe is buried in porous, sandy, gravelly or loam soils, untreated pipe is subject to decay.

The following conditions are discussed as most favorable for decay in the various styles of wood stave pipe:

CONTINUOUS STAVE. Continuous stave pipe which is exposed is most subject to decay at the joints. The following quotation

is taken from U. S. Department of Agriculture Bulletin No. 155 (Professional Paper).

"Decay of exposed pipes almost invariably starts at the ends of staves, as a result of leaky joints. Where water leaks out and runs down over the outside of the pipe favorable conditions are afforded for the growth of algae, which usually get a start, then mosses may begin to grow in the soil that collects on such spots, and decay spreads to adjoining staves."

Wood is more liable to attack by fungus on the end grain than on any other surface, which accounts for the development of decay at the end joints.

Wire-Wound Banded Couplings. The greatest point of weakness in this type of pipe is the banded joints. It is impossible to keep the bands saturated and hence decay sets in quickly, and spreads to other portions of the pipe.

Wire-Wound Inserted Couplings. This type of wood pipe also fails at the joints, resulting from a lack of water saturation due to physical conditions. The joints are most liable to attack by fungus when the pipe line deviates from a straight line, either in a vertical or horizontal direction. It is at these joints that decay almost always starts.

The three above mentioned types of wood stave pipe when used in an untreated condition, are also subject to decay under the following conditions:

- (1) When pipe line is under less than twenty-foot head hydrostatic pressure, or when pipe is empty a portion of the time.
 (2) When pipe line is buried in loam, sandy or gravelly
- (2) when pipe line is buried in loam, sandy or gravelly soil.

(3) When vegetable matter comes in contact with the staves.

The following quotations are taken from U. S. Department of Agriculture Bulletin No. 155:

"Based upon the experience in Spokane, Wash., the life of machine-banded wood pipe is given as ranging from 4 to 12 years. Such short life in most instances is probably due to bad judgment in the matter of location or the use of pipe under conditions altogether unfavorable to its life."

"In contact with soil the durability is nearly always a matter of some uncertainty."

"Contrary to the theories commonly held 30 years ago, it has been found that the durability of wood pipe is usually dependent on the life of the wood pipe rather than on the life of the bands. Only in rare instances, some of which have been cited, have the bands failed first."

"Where pipes are to be placed in contact with the soil, and where the internal pressure is not sufficient to insure complete saturation of the staves, it is probable that their durability may be increased by treating with some preservative."

ELIMINATING DECAY IN WOOD PIPE

There is no question but that a well creosoted wood stave pipe will prove a good investment under conditions unfavorable to untreated pipe. The treatment is not expensive since the pipe is composed of merely a wooden shell and does not require much oil per lineal foot of pipe.

CREOSOTED WOOD PIPE. The best creosote treatment for pipe is about as follows:

Pipe staves should be kiln dried and machined before treatment. Boil in oil or steam staves until in proper condition to receive the coal-tar creosote. Then press 10 to 11 pounds of oil per cubic foot into the wood at a temperature of 180 degrees Fahrenheit. Then release pressure and heat the charge in oil to a temperature of 230 to 240 degrees F., and hold at this temperature for one hour. This final heating bath expands the oil and removes the excess, thus preventing its mixing with the water later on when in service.

The pipe for use on the individual ranch, may after treatment, be buried in any kind of soil and subjected to severe adverse conditions without damage by decay. It so happens that the rery point in the pipe which is most subject to decay, namely, the end grain at joints and couplings, becomes more thoroughly impregnated with preservative than any other portion of the stave. This physical condition aids greatly in securing the greatest durability from the creosote treatment.

Wood stave pipe used under unfavorable conditions, where decay would occur in five or six years, should, if properly creosoted, last 20 to 25 years and probably longer. The cost of the aforementioned treatment is small, amounting to but 15 to 30 per cent of the cost of untreated pipe installed and should result in an increased length of life of two to six times that of the untreated pipe, depending upon prevailing conditions of soil, moisture, exposure, etc.. Creosoted pipe cannot be too strongly recommended, for its use eliminates the uncertainties found in untreated wood pipe.

FLUMES

There is an exceptionally good opportunity for the use of creosoted wood staves in flume building. The conditions for decay in wood pipe previously mentioned apply to open flumes and since it is not possible to depend on water saturation of the wood in open flumes, creosote treatment is highly recommended.

DOUGLAS FIR SILOS

Wooden silos are the least expensive type of silo and are in more general use throughout the country than any other form. As a result of a systematic study of the good and bad points of the wooden silo, rapid progress has been made during the last few years in perfecting this type.

MATERIALS OF CONSTRUCTION AND COST

A great variety of materials and forms of construction have been used in the past for silos with varying degrees of success. They may be divided into four classes, as follows:

- (1) Wooden silos;
- (2) Metal silos;
- (3) Monolithic concrete silos;
- (4) Block and concrete stave silos.

The cost of construction and maintenance of a silo is a very important factor in deciding the type to purchase. This cost varies considerably, according to the type, classes two and three being by far the most expensive and class one the least. The following table gives approximate cost of silos of the various types of construction:

Brick-Solid Wall	\$450	to	\$ 700
Brick-Air spaced hollow wall.	650	to	1,200
Cement Block	450	to	800
Hollow Tile—Cement both sides	450	to	800
Stone*Solid wall	485	to	800
Stone*-Double lined and air spaced	650	to	1,000
Concrete -Solid wallmonolithic construction.	300	to	600
Concrete -Hollow wall -monolithic construction	650	to	1,000
Wooden Stave	200	to	300

These figures are based on silos of the same dimensions, and show wood to be the least expensive material.

The extensive use of the wooden silo has resulted in its being subjected to some of the most extreme tests. Its weaknesses have been carefully studied in an effort to eliminate all of its objectionable features and at the present time it is in very general use throughout the entire country.

There are very few species of wood which possess the necessary combination of qualities required for silo construction. Douglas fir is especially suited to this use since clear material is readily obtainable, the wood is durable and the staves are straight

^{*} No value placed on stone except labor.

and strong. Probably more Douglas fir lumber is used annually in silo construction than any other species.

The objectionable features of the early wooden silos were shrinkage and decay. Shrinkage occurred during the warm dry summer weather, causing the staves to become loose and liable to collapse during heavy windstorms. This fault has been largely eliminated by the use of automatic adjustable hoops which keep a constant pressure on the walls of the silo.

CREOSOTED STAVE SILOS

The use of creosoted silo staves overcomes the difficulties of shrinkage in a different way. The presence of oil in the wood tends to minimize volume changes in the staves.

Decay has played a comparatively small part in reducing the life of the silo, except in cases where unsuitable species of wood have been used. Decay takes place most readily in wood that is subject to alternate wet and dry conditions. For this reason, creosoted lumber is desirable, since it retards the progress of decay, both by retarding moisture changes and by the antiseptic properties of the creosote.

The antiseptic qualities of creosote oil are well known and recognized. There have been considerable and varied claims made concerning the disastrous effect on the health of animals fed with silage from a creosoted silo. In order to determine the facts in the case, the U. S. Forest Products Laboratory at Madison, Wisconsin, recently conducted an investigation on this subject, and the following extract is taken from the report:

"While but few of the experiment stations had had any experience with creosoted silos, and only a small number of owners of such silos could be located, not a single case was reported where the silage had been damaged or the health or appetite of the stock affected. It was the general opinion of the experiment stations that no danger need be anticipated on this account."

With the present methods of treating Fir lumber it is possible to remove all excess or free oil from the wood, thereby eliminating "bleeding."

If it is not practicable to purchase a creosoted stave silo, a great deal of good may be accomplished by thoroughly painting the base of the staves and the joints between staves with hot coal-tar creosote. The expense of this operation is practically nil, and it will add several years to the life of a silo.

PAVING BLOCKS

Considerable original data have been collected regarding the effect of the various methods of treating upon the mechanical strength of the wood, and the total amount of shrinking and swelling which takes place in the wood when treated with different amounts of oil per cubic foot. The following specification provides a treatment which results in no material loss in strength of the fiber.

"The blocks shall be placed in the treating retort and a good grade of coal-tar creosote introduced and heated to approximately 215 degrees F. for two to four hours. The preservative shall then be drained off and a vacuum of 23 to 26 inches drawn to take out the surplus oil, vapors, gases, etc., from the wood cells. The vacuum shall then be broken by the introduction again of the preservative, which is then pressed into the wood at a temperature of 180 degrees F. until the blocks have received from 16 to 18 pounds of oil per cubic foot. After the blocks have received the required amount of oil, the pressure shall be released, and the temperature of the oil gradually raised to 215 to 230 degrees F., and held for one hour. This final heating expands the oil, vapors and gases within the wood, and causes a certain amount of the preservative to be expelled, due to this expansion, and also effects further seasoning of the wood. A final vacuum of 23 to 26 inches shall then be drawn, which dries the blocks of the surplus surface oil, leaving a thoroughly impregnated block which will never 'bleed' after being placed in the street, since it is forced to do its 'bleeding' during the treatment."

Figures obtained from tests on commercial material indicate the loss in strength of the fiber due to this treatment to be no more than 2 to 5 per cent, which, from a practical point of view, may be entirely neglected. The Association has done some careful experimenting to determine as nearly as possible what effects different amounts of oil have on the swelling and shrinking under extreme conditions. Results of these and other experiments indicate that the thoroughness of penetration plays an important part in reducing volume changes. For example, blocks treated with 17 pounds of oil per cubic foot, which amount is afterwards reduced to 12 pounds per cubic foot, have the same properties when put to the soaking test as blocks which are treated with 17 pounds of oil, all of which is left in the wood. The swelling takes place in the more lightly treated block at a slightly more

EXTREME WATER SCAKING TEST ON DOUGLAS FIR PAVING BLOCKS OF CREOSOTED AND NATURAL WOOD

Data secured by the Engineering Department of the West Coast Lumbermen's Association.

6 Total Change from Maximum after Soaking to Minimum after Aminmum Redaying Per Cent			Average Weight of Block	24.5 37.0 38.8	42.0 31.2 48.5	
	Total from Maxi after S to Min Re-d Per		Average Total Length of Block	2.02 2.05 2.11	2.26 2.75	
	5 Removed from Soaking Tank and Air-Seasoned 69 Days	Average Weight of Blocks	Per Cent Change	0.64	-8.37 -4.76 2.31	
2		Ave Ave Of B	Оппоез	16.0 19.4 18.9	13.1 18.0 13.3	
	noved fr k and 4	Removed from Soaking Tank and Air-Seasoned 69 Days Average Average Total Length of Block	Per Cent Change	1.34 1.81 1.90	-2.14 -0.89 0.93	
	Ren		греф	6.899 7.031 7.050	6.919 6.930 6.932	
	After Soaking in Water 66 Days	r Soaking in Water 66 Days	Average Weight of Blocks	Per Cent Change	25.5 38.0 39.4	33.6 26.5 50.8
~dt			Ave We	Ounces	19.9 26.5 26.2	19.1 23.9 19.6
			of Soaki 66 I rage Length	Average Fotal Length of Blocks	Per Cent Change	3.36 3.86 4.01
		Average Total Leng of Blocks	Inches	7.037 7.173 7.197	7.117 7.088 7.121	
	3 ately ately	th	Per Cent	100.0 100.0 100.0	100.0 100.0 100.0	
			Saouno	15.9 19.2 18.8	14.3 18.9 13.0	
			Per Cent	100.0 100.0 100.0	100.0 100.0 100.0	
			госрег	6.808 6.906 6.919	7.070 6 992 6 868	
. 03	sote	Creosote Treatment	Lbs. per	39X	9.4 16.6 15.1	Natural wood 7.070 14 1 9 9 6 992 Natural wood 6 868
	Crec Treat Libs Cu.		8801;)	14 4 22 3 20 7	Natura 14 1 Natura	
1	Teasoning Condition of Blocks when Treated			11% moi	Commercially Green, 30% Natural wood 7 moisture 30% 141 9 9 6 Air-seasoned, 11% moisture. Natural wood 6	
		Reference Num-		- 01 cc -	4 10 0	

--- sign denotes loss as compared to corresponding figure, Column 3.

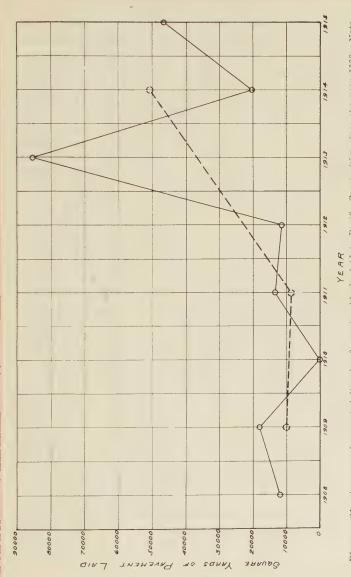


Diagram 21. Amount of creesoted Douglas fir paving blocks laid in Pacific Coast cities since the year 1908. marked increase in recent years.

rapid rate at first than in the block with the larger quantity of oil. In both cases it lasts through a long period of time. From a practical point of view, it is as easy to take care of the swelling in one case as in the other.

The material upon which the above mentioned tests were made, was selected to represent average commercial stock. planks were taken from as many logs and each cut into blocks. One block from each plank was used in each treatment shown in table 34. Due to this fact, the material in all treatments was similar and the results are comparable. It should be noted that the creosote treatment reduces the possible amount of swelling approximately 35 per cent. Comparing figures, column 6, under reference numbers 1 and 5, it will be seen that the total change in blocks treated green with approximately 14 pounds of oil is slightly greater than in air-seasoned blocks treated with the same amount of preservative. This is probably due to the fact that a less perfect coating of the cell walls is obtained with this amount of oil in the green blocks than in those seasoned before treatment. and indicates that green blocks should receive initial absorption of more than 14 pounds per cubic foot. The ideal treatment is to give a gross absorption sufficient to paint thoroughly the cell walls of the wood and afterwards reduce this absorption to 10 to 12 pounds per cubic foot. Blocks treated in this manner will be largely relieved of their tendency to shrink and swell and will not bleed under street conditions. Reducing the absorption in accordance with the above produces a better block at a lower cost. The treatment of blocks with 12 pounds per cubic foot as against 17 pounds represents a saving of approximately 15 cents per square yard, which, in view of the results, is worthy of consideration.

Creosoted Douglas fir paving blocks are gradually coming into more general use on the Pacific Coast. The City of Seattle up to 1915 had laid practically no wood block pavements. This city, together with the Port of Seattle Commission, laid more than 20,000 square yards of creosoted Douglas fir blocks in 1915. Diagram 21 shows the number of yards of creosoted wood blocks laid in Pacific Coast cities since 1908 and indicates the increased tendency to use this type of pavement.

FENCE POSTS AND POLES

Cedar is the most durable of Pacific Coast timber when used in the natural condition. Cedar posts or poles in normal locations are very durable; however, under certain adverse conditions, they succumb to the attack of fungus. Both red cedar and Douglas fir may be materially improved when used for poles and posts by giving them preservative treatment.

FENCE POSTS

Everyone is familiar with the decay characteristic in fence posts. The fungus, to thrive, must have food, warmth, moisture and air. Food and moisture are found in abundance in the wood. The other essentials are present through a large portion of the year in practically all climates in the United States. Rain soaks the ground all around the post and dries out slowly, thus making the moisture condition favorable for fungus growth, which accounts for its rapid development at this point.

The average layman has no conception as to the amount of lumber which is cut into fence posts annually. White oak, locust, Osage orange, and cedar have in the past stood at the head of the list in their ability to resist decay when used in a natural condition. Before preservation became so well established these species were used very largely for posts in all portions of the United States. The development of the creosoting industry, however, is changing past practice. When proper treatment is applied, all species are practically of equal durability. The following quotation is taken from U. S. Forest Service Circular No. 209, page 15, number 6:

"Species which, when untreated, decay most rapidly appear to give the greatest relative increase in service when treated. Loblolly pine, hemlock, beech and tamarack, which are the least resistant to decay when untreated, appear when 'reated to be equally as durable as treated longleaf pine, Spanish oak and white oak."

This makes it possible now to get good service out of wood which formerly would not have received any consideration. Experiments have been made on creosoted posts of some of the least durable woods found in the United States. These species have given good service for five years and are still sound. These

same posts, if set in a natural condition would have to be replaced on account of decay in two or three years. There is no question now but that a fence post when properly creosoted will last three to four times as long as a similar untreated post. This is particularly true of the less durable species.

The U.S. Forest Service has used a great many creosoted fence posts. Mr. Benedict, a forest supervisor at Hailey. Idaho, has recently used 500 lodgepole pine posts. This species is one of the least decay-resisting woods in the United States when used in a natural condition. The following quotation is taken from the March, 1915, number of "American Forestry," page 200, and shows what Mr. Benedict expects from treated lodgepole pine posts:

"In the ground, lodgepole pine untreated rots quickly. Given a bath in hot creosote from the bottom to a point above the ground line when set sufficiently to penetrate the outermost layers of the sapwood and all the openings through which decay could enter, the post should last from 12 to 20 years."

A Douglas fir heartwood post, without treatment, under conditions prevailing on the Pacific Coast, will last from five to six years. A similar post well creosoted, may be expected to last from 15 to 25 years.

If posts are creosoted, a smaller post may be used than is the usual custom. This is possible since it is not necessary to figure on the usual deterioration.

Creosoted posts do not require painting since the creosote gives the same effect as a brown stain. They can, however, if desired, be painted green, red or any dark color.

POLES

Poles, as in the case of posts, may be made durable by preservative treatment. Some poles are put up for temporary service and in such cases it would not be economy to treat them unless they would be removed and reset after serving in a temporary way. Poles for permanent use should, however, be given a thorough treatment before they are placed, which will give them fully twice the length of life secured from an untreated pole.

Figures 12 and 13, taken from U. S. Forest Service Bulletin No. 83, show an untreated Southern white cedar pole to be badly decayed after four years of service, and a creosoted loblolly pine pole with no sign of decay after 18 years.

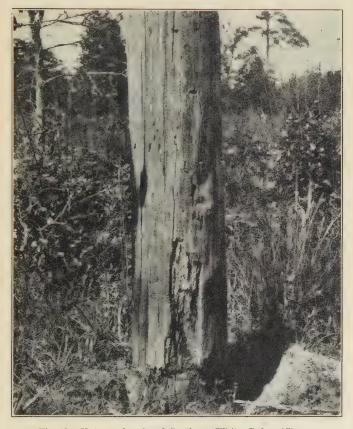


Fig. 12. Untreated pole of Southern White Cedar (Chamaecyparis Thyoides) after four years' service.



Fig. 13. Creosoted Loblolly pine pole after 18 years' service. No sign of decay.

The greatest profit will result from the use of treated poles in localities where the initial cost of the pole is high and also where replacements are expensive. Under such conditions, poles should never be placed without an efficient preservative treatment. In fact any pole which is intended for permanent service should have a butt treatment with creosote.

The following quotations are taken from page 40 of U. S. Forest Service Bulletin No. 84, and show the advisability of creosoting poles:

"Preservative treatment is profitable financially, the increased durability of the time decreasing the annual service charge. Relatively greater benefits are derived from the treatment of non-durable woods than from the treatment of those which possess great natural durability."

"Preservative treatment makes possible the use of poles of smaller butt circumference, since allowance usually made for deterioration by decay need not be considered, when it is certain that the full size and strength of the poles will be retained through a long period of years."

A creosoted pole line is much less apt to suffer damage from a sleet storm than one built of untreated poles, since untreated poles decay at the ground line, the point of greatest stress.

RED CEDAR SHINGLES

The physical characteristics of red cedar make it particularly adaptable to uses where durability and light weight are required, rather than tensile strength. Besides being practically immune from decay, this wood undergoes comparatively little shrinkage and swelling due to changes in moisture condition, and it holds paint well. The wood is soft and is not easily split by nails. These combined qualities place red cedar foremost as a shingle material. Approximately 85 per cent of Pacific Coast red cedar is manufactured into shingles.

The following method of laying red cedar shingles, taken, with slight changes, from the American Lumberman of November 27, 1915, unquestionably represents first-class practice.

CORRECT METHOD OF LAYING RED CEDAR SHINGLES

"The first essential is good Red Cedar shingles.

For rafters use sized 2x4s or 2x6s, spaced on not over two-foot centers, spiked solid and braced as load requires.

For roof boards or sheathing use good material. S1S strips 1x4 inches or random widths to not more than eight inches, spaced not more than two inches apart and nailed solid with 8d nails.

PREPARATION OF SHINGLES. If they are to be stained use dry shingles, dipping each one in the stain not less than eight inches from butt. Shingles that are not to be stained should be wet thoroughly before laying.

If additional fire-resistant quality is wanted, dip in good quality of mineral paint or such other approved fire-resistant treatment as may be available.

SHINGLE NAIL. Solid copper, solid zinc or hot-dipped zinccoated nails preferred. Where these are not available use oldfashioned cut nails.

Size of Nam. For 5 to 2 inches or thinner shingles, 3d; for thicker shingles, 4d.

LAYING THE SHINGLES. Start at eaves and lay first coarse 2-ply, giving first course 2 inches projection over crown mold and 1-inch projection at gables.

On one-third or more pitch lay 16-inch shingles 412 inches to the weather; on less than one-third pitch lay 16-inch shingles

PACIFIC COAST WOODS

4 inches to the weather. On one-third or more pitch lay 18-inch shingles 5½ inches to the weather; on less than one-third pitch lay 18-inch shingles 4½ inches to the weather.

Use a straight edge to make sure courses are laid straight. Break all joints at least 1¼ inches, seeing that no break comes directly over another on any three consecutive courses, thereby covering all nails.

Nail shingles 6 inches from butt (for 4½ inch lap) and ½-inch from sides, and put only two nails in each shingle. Shingle wider than 10 inches should be split.

Lay shingles so that water will run with the grain, and do not drive nail heads into shingles.

Lay wet shingles with butts close together. Leave ¼-inch space between dry shingles.

Use 14-inch galvanized iron, not less than 26-gauge, or best quality old-style tin, heavily coated, for valleys; copper or galvanized iron for ridge roll.

Use galvanized or heavily coated tin flashing around chimneys. If tin is used it should be painted two coats, one as soon as roof is completed and the second coat within two weeks. Galvanized metal should be painted two coats but should be given 30 days for oxidation before painting. No patent dryer or turpentine should be used.

Finish hips by laying a course of even width narrow shingles on both sides of hip over regular courses."

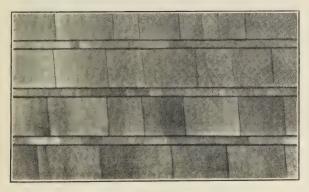


Fig. 14.

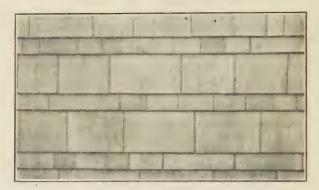


Fig. 15.

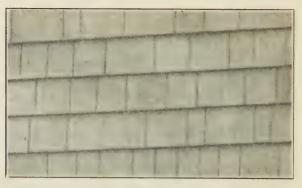


Fig. 16.

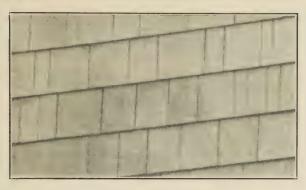


Fig. 17.

Figures 14 to 17 show four distinct styles of laying shingle siding.

GRADING RULES FOR SHINGLES

Some very decided improvements have recently been made in the grading of Red Cedar shingles. It is possible now for the purchaser to obtain branded shingles. This branding guarantees quality.

GRADING RULES FOR RED CEDAR SHINGLES WHICH HAVE BEEN IN GENERAL USE SINCE 1908

Perfection. 18". Variation of 1", under or over, in length, allowed in 10 per cent. Random widths, but not narrower than 3". When dry 20 courses to measure not less than 8\%4". To be well manufactured. Ninety-seven per cent to be clear, remaining 3 per cent admits slight defects 16" or over from butt.

Puget A. 18". Random widths, but not narrower than 2". When dry, 20 courses to measure not less than 8\(\frac{1}{4}\)". Admits feather tips and 16" shingles resulting from shims, and other defects 8" or over from butt.

EUREKA. 18". Variation of 1", under or over, in length allowed in 10 per cent. Random widths, but not narrower than 3". When dry, 25 courses to measure not less than 9\%4". To be well manufactured. Ninety per cent to be clear, remaining 10 per cent admit slight defects 14" or over from butt.

SKAGIT-A. 18". Random widths, but not narrower than 2". When dry, 25 courses to measure not less than 914". Will admit feather tips, and 16" shingles resulting from shims, and other defects 8" or over from butt.

EXTRA CLEAR. 16". Variation of 1", under or over, in length, allowed in 10 per cent. Random widths, but not narrower than 2½". When dry, 25 courses to measure not less than 9½". To be well manufactured, 90 per cent to be clear, remaining 10 per cent admits slight defects 12" or over from butt.

CHOICE A. 16". Random widths, but not narrower than 2". When dry, 25 courses to measure not less than 9". Admits wane and 12" shingles resulting from shims, and other defects 6" or over from butt.

EXTRA *A*. 16". Variation of 1", under or over, in length allowed in 10 per cent. Random widths. But not narrower than 2". When dry, 25 courses to measure not less than 734". To be well manufactured. Eighty per cent to be clear, remaining 20 per cent admits defects 10" or over from butt. If not to exceed 2 per cent (in the 20 per cent allowing defects 10" from butt) shows defects closer than 10", the shingles shall be considered up to grade.

STANDARD A. 16". Random widths, but not narrower than 2". When dry, 25 courses to measure not less than 7½". Admits wane and 12" shingles resulting from shims, and other defects 6" or over from butt.

PACKING

All shingles to be packed in regulation frame 20" in width. Openings shall not average more than 1½" to the course.

Perfection and Puget A shall be packed 20-20 courses to the bunch, 5 bunches to the M.

Eureka, Skagit A, Extra Clear, Choice A, Extra *A*, Standard A (dimension shingles excepted) shall be packed 25-25 courses to the bunch, 4 bunches to the M.

Dimension shingles (5") shall be packed 24-24 courses to the bunch, 4 bunches to the M.

The character "M" indicates the multiple or unit by which red cedar shingles are bought and sold.

Every bunch shall be branded with full name of the grade as stated in these rules.

Color of wood and sound sap shall not be considered defects. Percentage, when specified in these rules, applies in a general way to the total amount of shingles of like grade in a car.

GRADING RULE ADOPTED BY THE SHINGLE BRANCH OF THE WEST
COAST LUMBERMEN'S ASSOCIATION FOR SHINGLES
BEARING RITE-GRADE TRADEMARK

18" RITE-GRADE PERFECTS. Random widths but not narrower than 3". When dry, 20 courses to measure not less than 8\%". To be strictly clear and vertical grain and free from sap.

18" RITE-GRADE SELECTS. Random widths but not narrower than 3". When dry, 20 courses to measure not less than 8"4". Eighty per cent to be clear, remaining 20 per cent admits defects 12" or over from butt. To be free from sap.

16" RITE-GRADE PERFECTS. Random widths but not narrower than 3". When dry, 25 courses to measure not less than $9\frac{1}{2}$ ". To be strictly clear and vertical grain and free from sap.

16" RITE-GRADE SELECTS. Random widths but not narrower than 3". When dry, 25, courses to measure not less than 9½". Eighty per cent to be clear, remaining 20 per cent admits defects 10" or over from butt. To be free from sap.

16" RITE-GRADE PERFECTS 6/2. Random widths, but not narrower than 3". When dry, 25 courses to measure not less than 8". To be strictly clear and vertical grain and free from sap.

16" RITE-GRADE EXTRA *A*. Random widths, but not narrower than 3". When dry, 25 courses to measure not less than 8". Eighty per cent to be clear, remaining 20 per cent admits defects 10" or over from butt. To be free from sap.

16" DIMENSIONS RITE-GRADE. 5" wide. Made under specifications for above 16" grades but must be strictly clear.

PACKING

All shingles must be well manufactured.

18" Rite-Grade shall be packed 20-20 courses to the bunch, 5 bunches to the M.

16" Rite-Grade shall be packed 25-25 courses to the bunch, 4 bunches to the M.

Dimension Rite-Grade shall be packed 24-24 courses to the Funch, 4 bunches to the M.

THE WEST COAST LUMBERMEN'S ASSOCIATION

All shingles to be packed in regulation frame 20" in width. Band sticks not less than 19½" long.

Openings shall not average more than 11/2" to the course.

Every bunch shall be branded with full name of the grade as stated in these rules.

Color of wood is not a defect.

All shingles to be packed in straight courses.

One inch under and over in length admitted.

Any shingle not over $\frac{1}{4}$ " off parallel shall be considered parallel.

Not over 4 per cent off grade admitted for discrepancy in inspection.

(Percentage, when specified in these rules, applies in a general way to the total amount of shingles of like grade in a car. The character "M" indicates the multiple or unit by which these shingles are bought and sold.)

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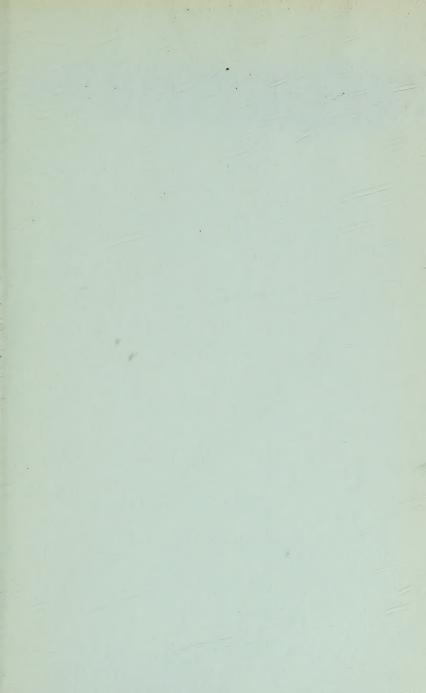
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